ALBERTA
CANCER
BOARD

EPIDEMIOLOGY, PREVENTION AND SCREENING

Cancer in Alberta
A Regional Picture

June 2000

ALBERTA CANCER BOARD

ABOUT THE ALBERTA CANCER BOARD

Facilities and Services

The Alberta Cancer Board is a Provincial Health Authority operating cancer facilities and programs in Alberta. Services include cancer prevention, early detection, diagnosis, treatment, research and education. Also included in this role is coordinating in cooperation with others, the planning, development and delivery of provincial cancer initiatives. As part of this mandate the Alberta Cancer Board operates:

- **Cancer treatment and research facilities:** Cross Cancer Institute in Edmonton and Tom Baker Cancer Centre in Calgary
- **Associate Cancer Centres:** Grande Prairie, Lethbridge, Red Deer and Medicine Hat
- **Community Cancer Centres** (in partnership with RHAs)**:** Headwaters RHA 3 in High River, RHA 5 in Drumheller, East Central RHA 7 in Camrose, West View RHA 8 in Hinton, Aspen RHA 11 in Barrhead, Lakeland RHA 12 in Bonnyville, Peace RHA 14 in Peace River and Northern Lights RHA 16 in Fort McMurray
- **Division of Epidemiology, Prevention and Screening:**
  - **Population Health Research:** conducts research into population-based trends in cancer incidence, morbidity and mortality, the causes of cancer, prevention strategies and the early detection of cancer
  - **Alberta Cancer Registry:** a population-based registry of cancer cases in the province
  - **Screen Test: Alberta Program for the Early Detection of Breast Cancer:** a screening mammography and breast health education program with fixed-site offices in Calgary and Edmonton and mobile mammography services throughout the province
  - **Prevention Outreach:** provides a variety of services to RHAs, including cancer information, assistance with program and policy development and linkages to resources

The Community Cancer Network

The Alberta Cancer Board participates in the Community Cancer Network to connect cancer control efforts around the province and bring cancer services closer to home. The Network extends the Alberta Cancer Board's expertise in cancer control programs (including prevention, screening, diagnosis, treatment, supportive and palliative care), cancer epidemiology and cancer research to urban and rural communities through collaboration with Regional Health Authorities and others.

Cancer in Alberta

A Regional Picture

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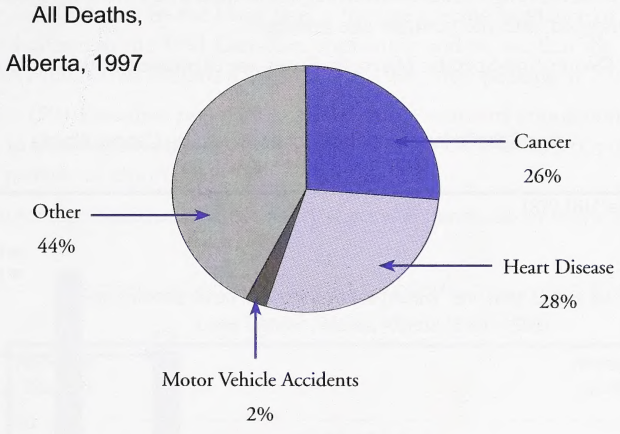
PREFACE

The Division of Epidemiology Prevention and Screening is pleased to provide *Cancer in Alberta: A Regional Picture*. This, the second in a series of annual reports presenting data from our Alberta Cancer Registry, looks at cancer trends and regional rates. It aims to provide health professionals and planners in Alberta's Regional Health Authorities with detailed information about common cancer sites to assist in priority setting and decision-making. Cancer is the second leading cause of death in Albertans, as the pie chart below shows.[1]



The Alberta Cancer Registry registered over 9,000 new cases of invasive cancer (excluding nonmelanoma skin cancer) per year in 1995, 1996 and 1997. Approximately 4000 people died of cancer per year in that period. To date detailed statistics have been compiled through 1997. The last year specified for much of the data is 1996 because of the use of 3 year moving averages; the data presented for 1996 data are an average of 1995 – 1997.

For a better understanding of the statistical information read *Understanding the Graphs* located immediately following the *Preface.*

Alberta statistics are contained in the bound portion of the publication. The Alberta data are organized by cancer site. Region specific data are located in the pocket inside the back cover.

The *Technical Report* gives details on data collection and coding. For more information contact Ellen Murphy at the Alberta Cancer Board.

[1] Government of Alberta, *Alberta Vital Statistics* (1999)

UNDERSTANDING THE GRAPHS

The examples below are given to aid in interpreting the graphs.

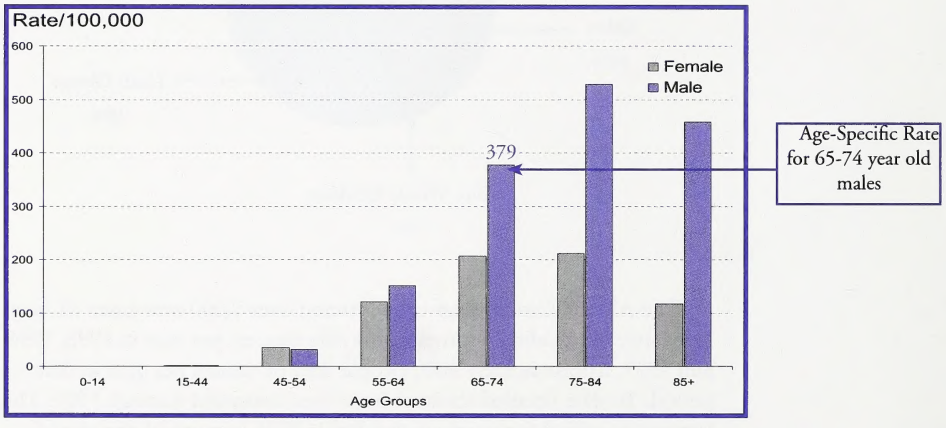
Age-Specific Incidence Rates

Age-specific incidence rates are used to compare the incidence of cancer between age groups. Age-specific incidence rates indicate the number of new cases that occur during a year in a specific age group, expressed as a rate per 100,000 persons in that age group. The bars on the graph below indicate the age-specific rates for lung cancer in Alberta for 1996. The age-specific rate of lung cancer in 65-74 year old Alberta males in 1996 was 379 cases per 100,000 males in that age group.

Usually the incidence of cancer varies sharply across age groups. Note that the incidence of invasive lung cancer is much higher in men in the 65-74, 75-84 and 85+ age groups compared with the younger age groups.

(Note: Age-Specific Mortality Rates are expressed in the same manner)

Age-Specific Incidence Rates for Invasive Lung Cancer, Alberta
1996 (average of 1995-1997)



Age-Standardized Incidence Rates

Age-standardized incidence rates (ASIR) are used to compare incidence among populations and to identify trends within a population. Alberta's population is aging and cancer incidence rates rise with age, therefore the number of cases of cancer is increasing. It is important to note that the increased number of cases does not mean that the rate of cancer is increasing. Comparing the number of cases of cancer in the younger and smaller 1980 population to the older and larger 1996 population gives an indication of the increased burden on the health care system, but does not indicate trends in the underlying disease rates.

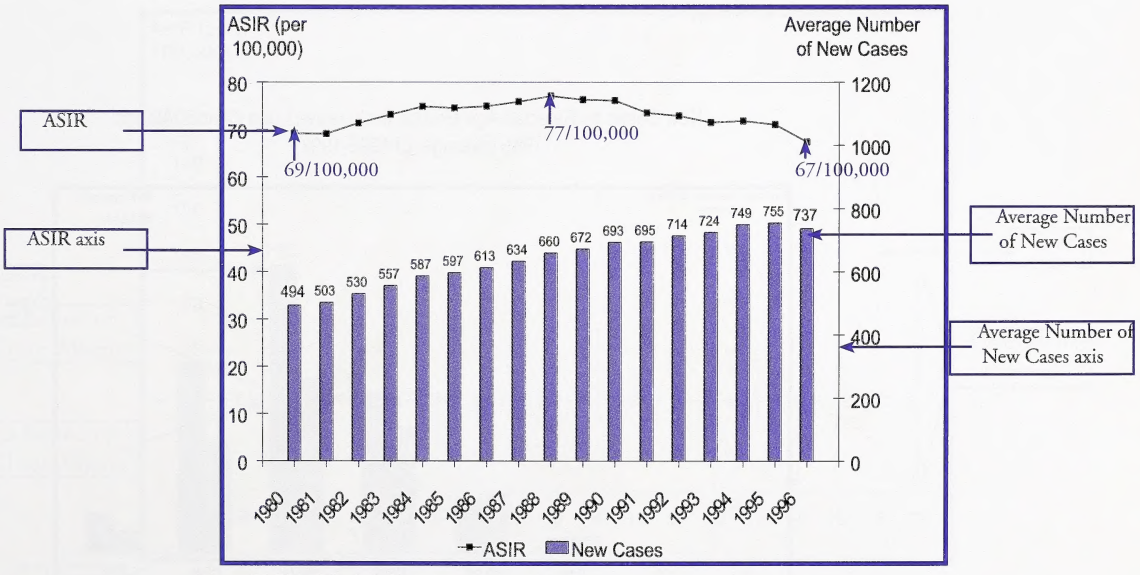
ASIR are used to follow trends. ASIR are rates that are adjusted to account for changes in the size and age distribution of the population from year to year. The actual rates (age-specific rates) of cancer in the population (the Alberta population) are applied to a standard population (the 1991 Canadian population). For example, the rate of cancer in each age group for 1980 in Alberta is applied to the 1991 Canadian population, and then the same thing is done for each year from 1981 to 1996.

Note on the graph below that the number of new cases of invasive lung cancer in males increased from 494 in 1980 to 737 in 1996 as indicated on the blue bars. This is an alarming increase and has a major impact on the resources needed to care for patients with lung cancer. Using ASIR (shown by the black line) – the age specific incidence of lung cancer in males is standardized to the 1991 Canadian population and we see that the ASIR actually decreased from 69/100,000 in 1980 to 67/100,000 in 1996, after peaking at 77/100,000 in 1988.

The 1991 Canadian population is used as the standard population in the calculation of ASIR in this document. It is also generally used as the standard population for Canadian and other provincial reports.

(Note: Age-Standardized Mortality Rates are standardized in the same manner)

Age -Standardized Incidence Rates (ASIR)* and New Cases for Invasive Lung Cancer , Males, Alberta (1980-1996)



*3-Year Moving Averages

3-Year Moving Averages

ASIR (age-standardized incidence rates) and ASMR (age-standardized mortality rates) are presented in this document as three-year moving averages. To calculate a three-year moving average, the rate or frequency of the event is summed for three years cantered on the year of interest and divided by three. For example, the number of cases of lung cancer in Alberta men in 1996 is calculated by adding the total number of lung cancers that occurred in 1995-1997 inclusive, then dividing by three. As shown on the ASIR graph on the previous page, there were 737 cases of lung cancer in Alberta men in 1996.

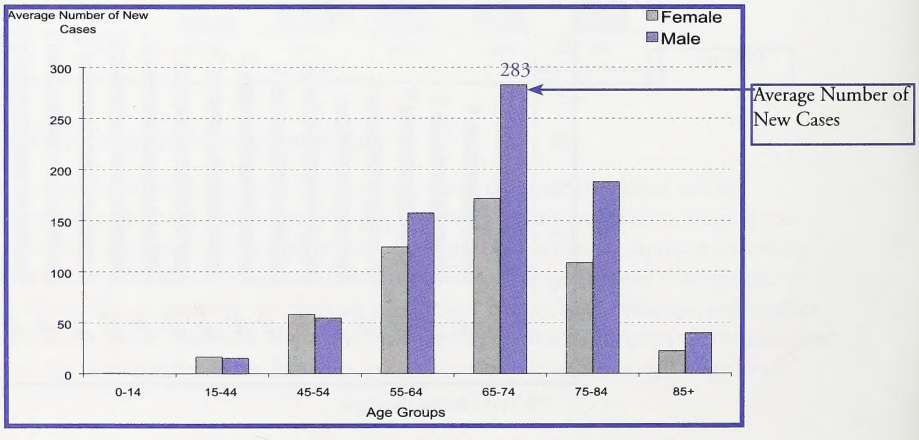
Moving averages are used to smooth out year-to-year fluctuations so that the underlying trend may be more easily observed. Moving averages are important to use when the numbers of cancer in each year are relatively small; in this situation year-to-year variability can be quite erratic.

Average Number of New Cases

When only one year is shown, it is presented as a three-year average. For example in the graph below, the average number of new cases of lung cancer for males in the 65-74 year old age group in 1996 is 283 cases, an average of the number of cases in 1995, 1996 and 1997.

(Note: The number of deaths is also presented as a three-year average and calculated in the same manner as new cases. Age-specific incidence and mortality rates are also presented as three-year averages.)

New Cases by Selected Age Groups for Invasive Lung Cancer, Alberta
1996 (average of 1995-1997)

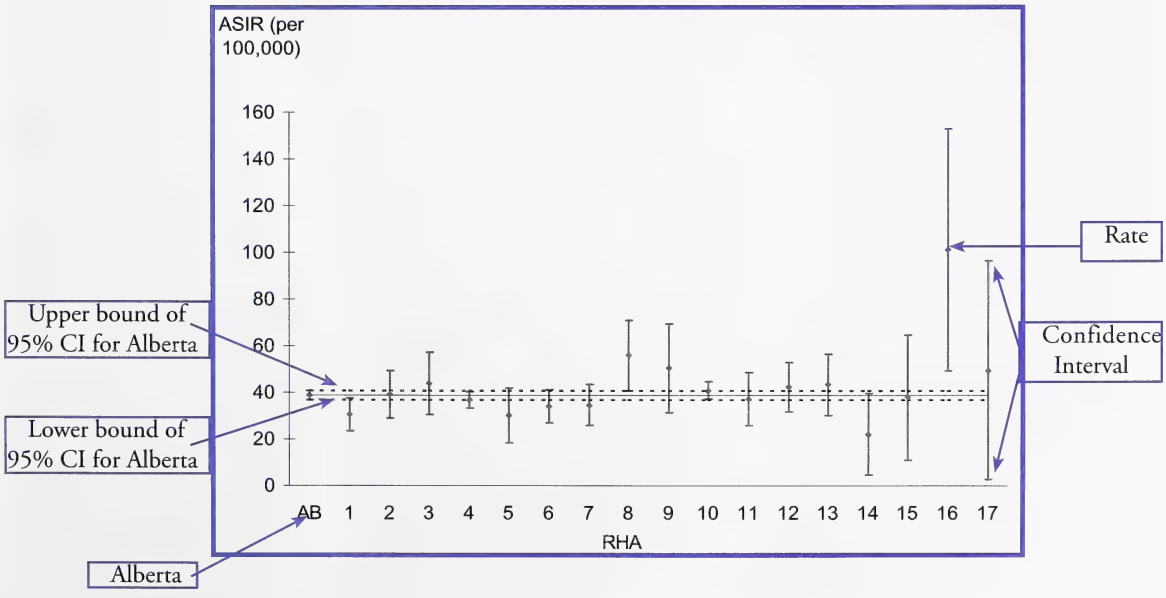


Confidence Intervals

A confidence interval (CI) indicates the precision of an estimate. In the figure below the solid diamond represents the rate. The bars extending from the solid diamond indicate the confidence interval. Confidence intervals are partly a function of the population size; as the population size increases CIs narrow. Wide CIs indicate less precision and occur when the population size is smaller. Note for example, the wide CIs for Regions 16 and 17 below. Both RHAs have a relatively small population. Large populations are less prone to variation due to chance than small populations, and therefore produce narrower confidence intervals. Consequently, the Alberta CI is narrower than those of the regions. The age-standardized rate for Alberta is dominated by the rates for RHA 4 (Calgary) and RHA 10 (Capital), which represent two-thirds of the population of Alberta.

In order to evaluate the age-standardized rate of an RHA note should be taken of the variability of the rates among the RHAs, as well as the width of the confidence interval. Age-standardized rates should be monitored over time.

Age-Standardized Mortality Rates (ASMR) by RHA with 95% Confidence Intervals (CIs) for Invasive Lung Cancer, Females, 1996 (average of 1995-1997)



Cancer in Alberta
A Regional Picture

Alberta Data

THE BIGGER PICTURE - POPULATION

Alberta's population is growing – the population increased 31% from 1980 to 1996. Alberta is divided into 17 RHAs identified by number and name as shown on the map on the next page. The populations of the RHAs vary dramatically. RHA 4, the largest RHA, has a population almost 50 times RHA 17, the smallest RHA. This population variation affects the precision of regional data presented in this report. The incidence and mortality data from the larger regions can be calculated with more precision than that of the smaller regions.

Alberta's population is also aging, thus the number of new cases and deaths from cancer is increasing because cancer is more likely to develop with age. The proportion of Alberta's population 65 years and older increased from approximately 7% in 1980 to 10% in 1996. Fifty-six percent (56%) of new invasive cancers occur in this group, highlighting the importance of this age group in determining cancer burden.

Alberta and Its RHAs: Population and New Cases of Invasive Cancer 1996 (average of 1995-1997)

	Population		New Cases of Invasive Cancer				
	Total	% 65yrs & over	0-14 yrs	15-64 yrs	65+ yrs	Total	NMSC*
Alberta	2740067	10.0	81	4012	5178	9270	3887
RHA 1	144342	12.9	3	206	376	585	319
RHA 2	85382	12.9	3	127	216	346	135
RHA 3	66947	10.2	3	103	133	240	119
RHA 4	834392	8.9	20	1253	1398	2671	1260
RHA 5	51024	12.4	2	74	120	195	85
RHA 6	177194	10.7	7	268	373	648	267
RHA 7	101416	14.6	2	153	275	430	155
RHA 8	85645	7.2	4	128	129	261	98
RHA 9	38592	10.3	1	60	81	142	47
RHA 10	785380	10.3	22	1147	1486	2655	1052
RHA 11	80477	10.1	3	125	164	291	93
RHA 12	105296	11.4	2	142	239	382	128
RHA 13	84205	7.8	5	106	112	224	82
RHA 14	19982	9.2	1	26	34	61	18
RHA 15	24935	5.3	2	24	22	48	9
RHA 16	37026	2.0	1	57	11	69	16
RHA 17	17832	3.6	1	13	8	23	4

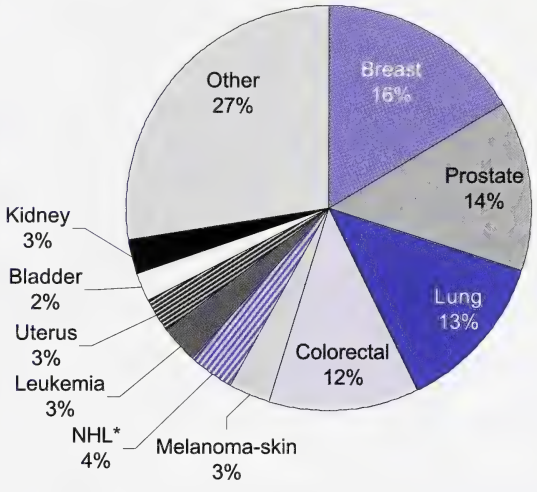
**NMSC= Nonmelanoma Skin cancer, these cases have not been included in the total*

THE BIGGER PICTURE - RHA MAP

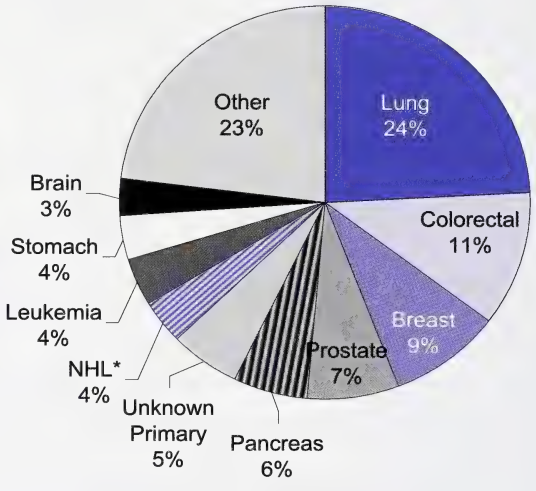
Alberta's Regional Health Authorities by Name and Number

ALL CANCERS - TOP TEN

New Invasive Cancers by Site, Alberta, 1997



Cancer Deaths by Site, Alberta, 1997



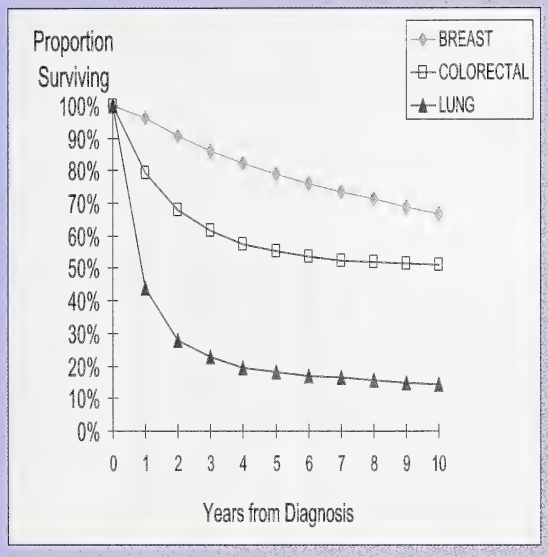
The top 10 invasive cancers are depicted in the pie charts. The top four cancers in 1997 were Breast, Prostate, Lung and Colorectal. These 4 cancers were responsible for over 50% of new cancers and cancer deaths in 1997. The *Other* category for new cancers includes cancers that accounted for less than two percent each of the total number of cancers, and the *Other* category for cancer deaths includes cancers that caused less than 3% each of cancer deaths. Notice that 4 cancers – Pancreas, Leukemia, Stomach and Brain were responsible for 17% of the deaths in 1997, but were not individually identified in the first pie chart because they each accounted for less than 2% of the new cases. The reason for this difference is these cancers can have a poorer prognosis and therefore contribute more strongly to the mortality figures than other cancers.

**Non-Hodgkin's Lymphoma*

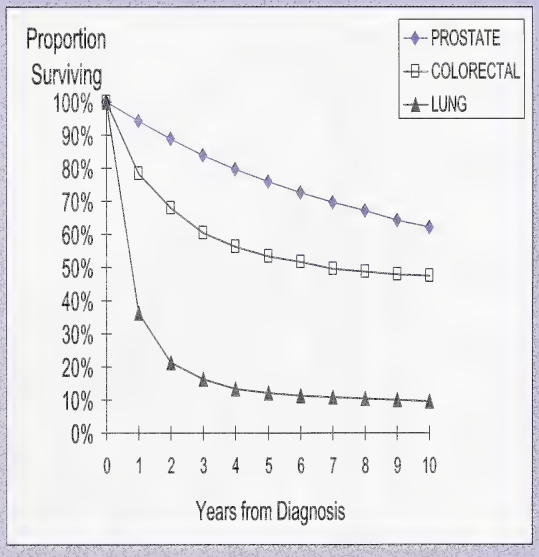
All Cancers - survival curves

Cause Specific Survival Curves, Alberta (cases diagnosed 1985-1993)*

Female Cancers



Male Cancers

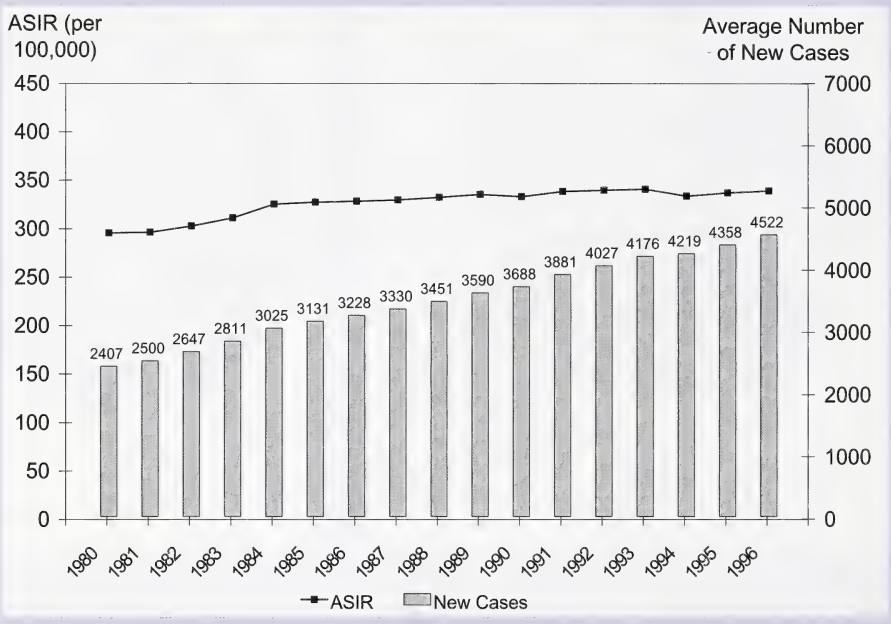


The number of years of survival after diagnosis of cancer depends on several factors. Survival is determined by the stage of cancer at diagnosis, type of cells affected, age at diagnosis and treatment. Females have a slightly better survival rate at 10 years after diagnosis than males for both lung and colorectal cancers. Overall survival from lung cancer is extremely poor with over 50% of cases dying within one year. Survival after breast or prostate cancer decreases at a more constant rate than either that of lung or colorectal cancer.

**Those cases not known to be dead were censored either at the date they left the province or March 31, 1998*

ALL CANCERS - INCIDENCE

Age-Standardized Incidence Rates (ASIR)* and New Cases for All Invasive Cancers**, Females, Alberta (1980-1996)

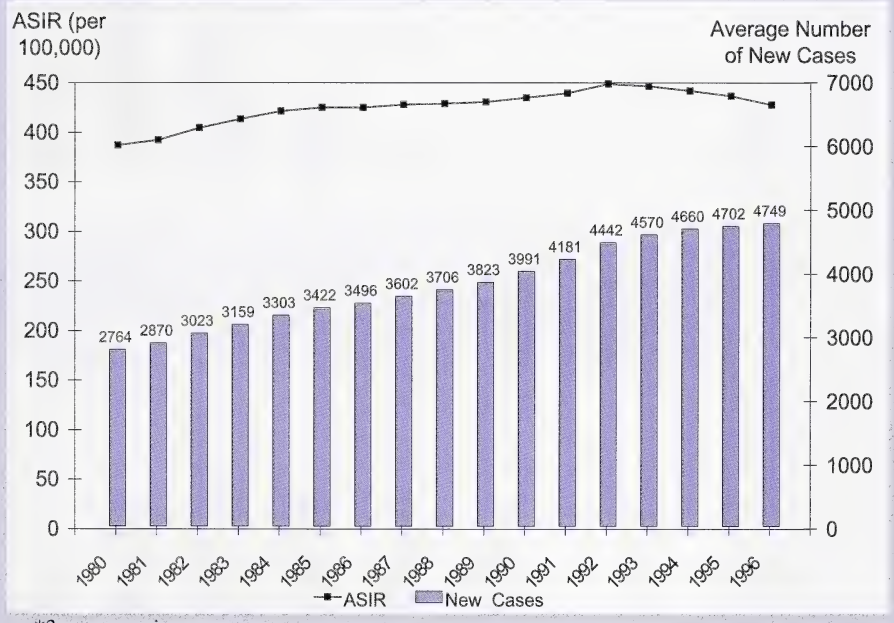


*3 year moving averages

Age-standardized rates of cancer incidence in women have remained relatively stable over the past 10 years, as large increases in lung cancer have been offset by declining or stable rates for most other forms of cancer. The most common types of cancer in women are breast, lung and colorectal. The number of new cases is increasing due to an aging and growing population.

***Excluding Nonmelanoma Skin Cancer*

Age-Standardized Incidence Rates (ASIR) and New Cases for All Invasive Cancers**, Males, Alberta (1980-1996)*

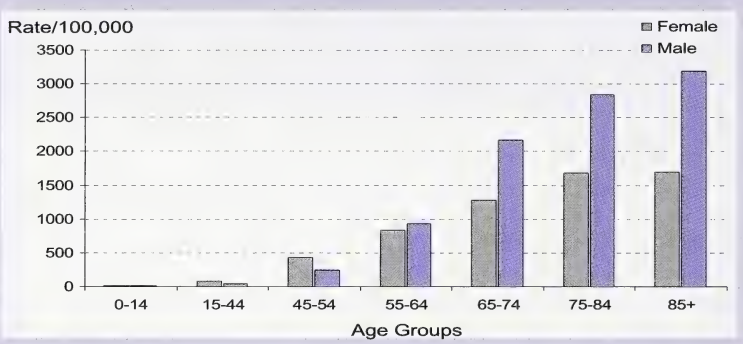


*3 year moving averages

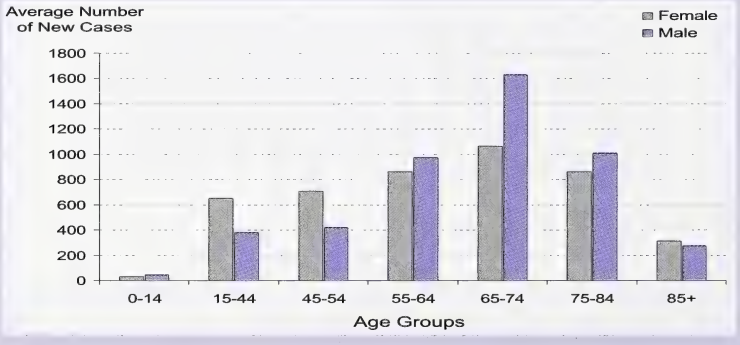
Age-standardized rates of cancer incidence in men have declined in the last few years. The incidence rate peaked in 1992, and has declined since then. The most common types of cancer in men are prostate, lung and colorectal. In spite of the decline in incidence rate, the number of new cases is increasing due to an aging and growing population.

***Excluding Nonmelanoma Skin Cancer*

Age-Specific Incidence Rates for All Invasive Cancers, Alberta 1996 (average of 1995-1997)*



New Cases by Selected Age Groups for All Invasive Cancers, Alberta 1996 (average of 1995-1997)*

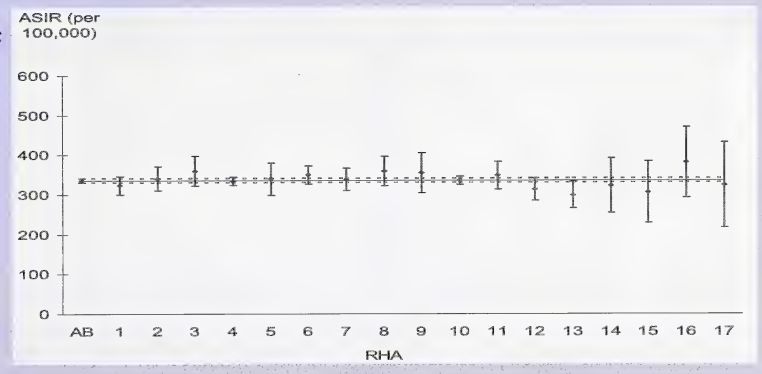


Cancer can occur at any age, but as the charts show the rates and numbers are higher in the older age groups. Note that the incidence rates are much higher for men than for women after age 64.

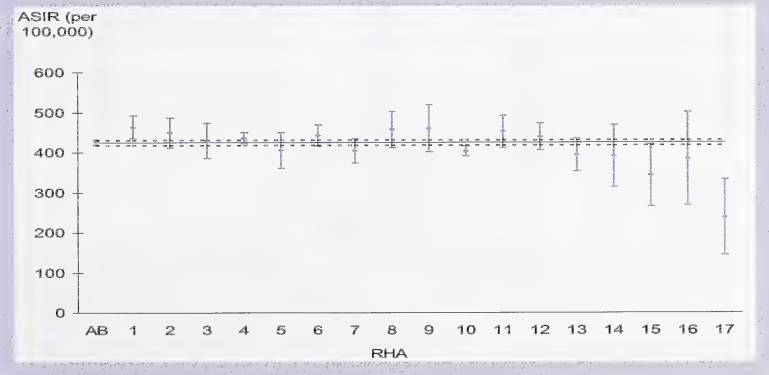
**Excluding Nonmelanoma Skin Cancer*

Age-Standardized Incidence Rates (ASIR) by RHA with 95% Confidence Intervals (CIs) for All Invasive Cancers, 1996 (average of 1995-1997)*

Females



Males



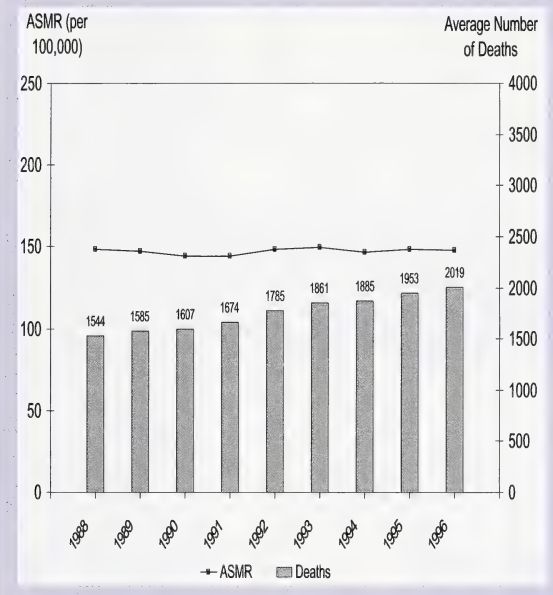
For females, there is very little variation among the RHAs. For males there is more variation (especially among smaller RHAs), but even with statistical adjustment small numbers may result in erratic estimates. This pattern will be monitored to see if it continues over a number of years.

**Excluding Nonmelanoma Skin Cancer*

ALL CANCERS - MORTALITY

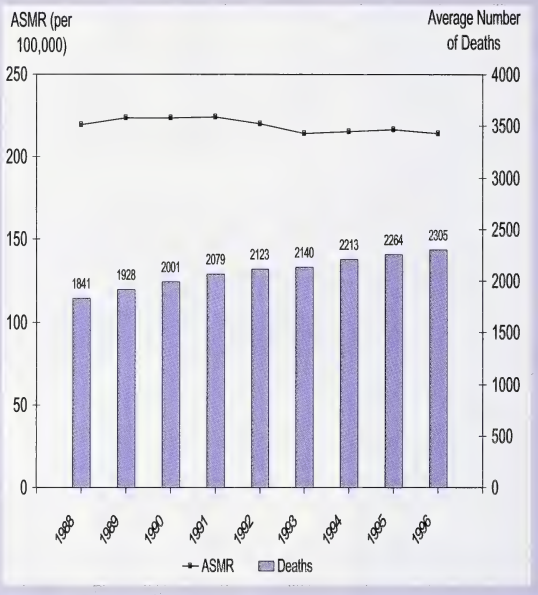
Age-Standardized Mortality Rates (ASMR)* and the Number of Deaths for All Invasive Cancers, Alberta (1988-1996)

Females



*3 year moving averages

Males

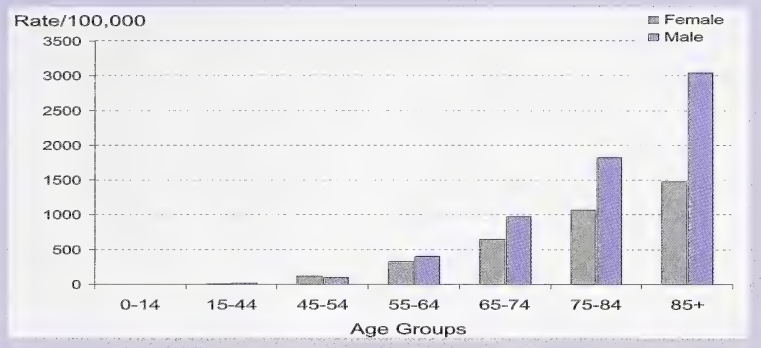


*3 year moving averages

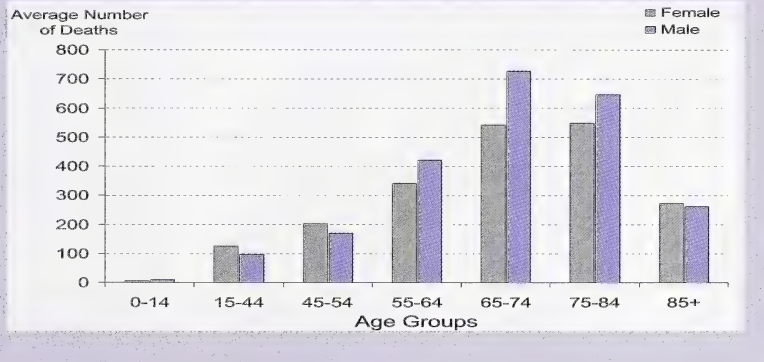
Cancer is the second leading cause of death in Albertans. The cancer mortality rates in women have been relatively stable. A mortality rate of 148 per 100,000 in 1988 was repeated in 1996, with some fluctuation in the intervening years. As you will see in this document, for women, large increases in lung cancer mortality rates have been offset by declining or stable rates for most other forms of cancer.

Mortality rates in men have decreased slightly from 219 deaths per 100,000 in 1988 to 214 deaths per 100,000 in 1996. The slight increase in the mortality rate for prostate cancer was offset by the decrease in mortality rates for lung, colorectal and other cancers.

Age-Specific Mortality Rates for All Invasive Cancers, Alberta 1996 (average of 1995-1997)*



Number of Deaths by Selected Age Groups for All Invasive Cancers, Alberta 1996 (average of 1995-1997)*

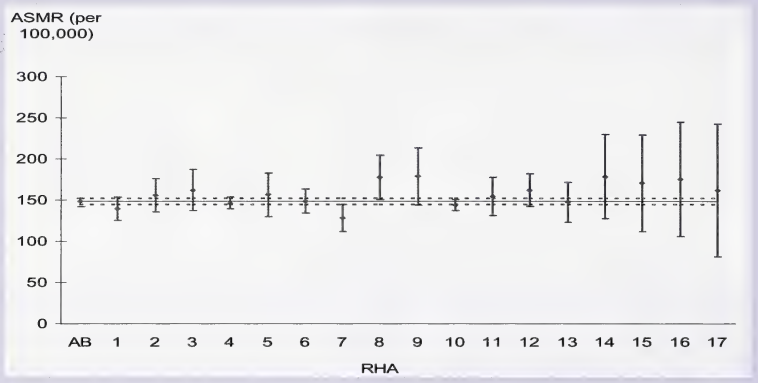


The mortality rates show a sharp increase with age, particularly in men. However, the number of cancer deaths drops off after age 75 for men and after age 85 for women. This is because there is a smaller population in the older age groups, as people die of other causes.

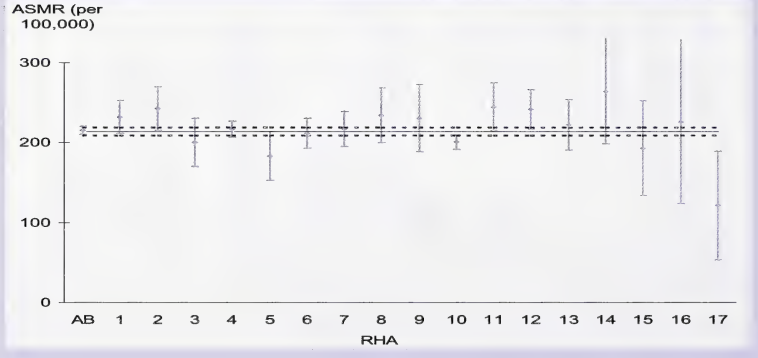
**Excluding Nonmelanoma Skin Cancer*

Age-Standardized Mortality Rates (ASMR) by RHA with 95% Confidence Intervals (CI), All Invasive Cancers,1996 (average of 1995-1997)*

Females



Males

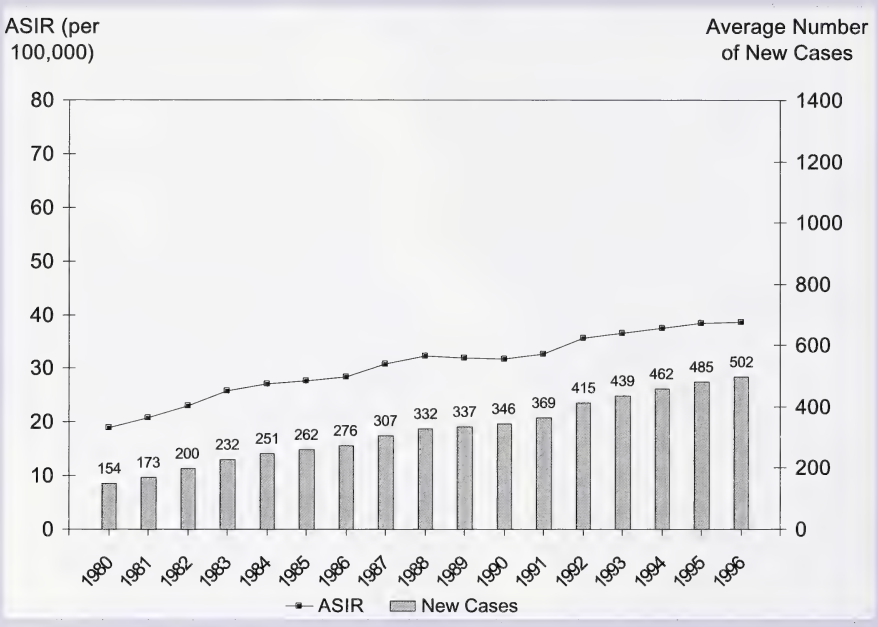


Similar to cancer incidence, there is less variation in mortality rates among females than males. This pattern will be monitored to see if it continues over a number of years.

**Including Nonmelanoma Skin Cancer*

LUNG CANCER - INCIDENCE

Age-Standardized Incidence Rates (ASIR) and New Cases for Invasive Lung Cancer, Females, Alberta (1980-1996)*

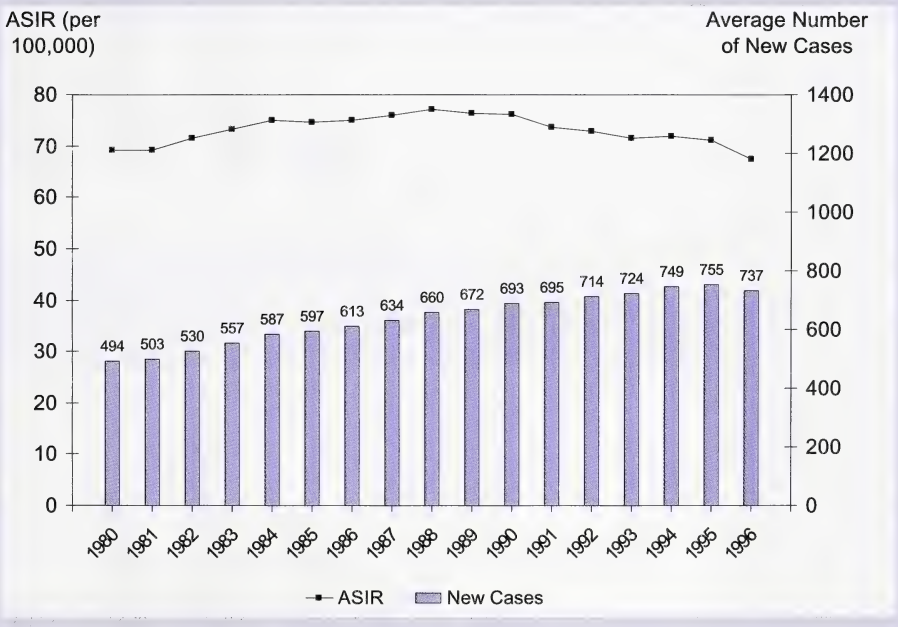


*3 year moving averages

Lung cancer incidence rates in females have increased markedly over the last two decades and the number of female lung cancer cases has more than tripled since 1980. The rising trend in lung cancer incidence in females reflects their increase in smoking behavior 20 to 30 years previously. Over 80% of lung cancers are attributed to tobacco exposure.[1] Alberta women's rates of smoking peaked in 1966 at 30% followed by a dramatically increased rate of lung cancer from 19 per 100,000 in 1980 to 39 per 100,000 in 1996.[2] Prevalence of smoking in women has been quite stable – 28% of women were smokers in 1999.[3] The rate of smoking in women is now similar to that of men. Unfortunately, female lung cancer rates can be expected to continue to increase.

1 Roth, Jack A., James D, Cox, and Waun Ki Hong, *Lung Cancer, 2nd Edition (* London: Blackwell Science Inc., 1998.) 2.
2 Health and Welfare Canada, *Smoking Habits of Canadians 1965-1979* (Ottawa, 1980) 21.
3 Health Canada, *Canadian Tobacco Use Monitoring Survey* (Ottawa, 1999) Table 3.

Age-Standardized Incidence Rates (ASIR) and New Cases for Invasive Lung Cancer, Males, Alberta (1980-1996)*



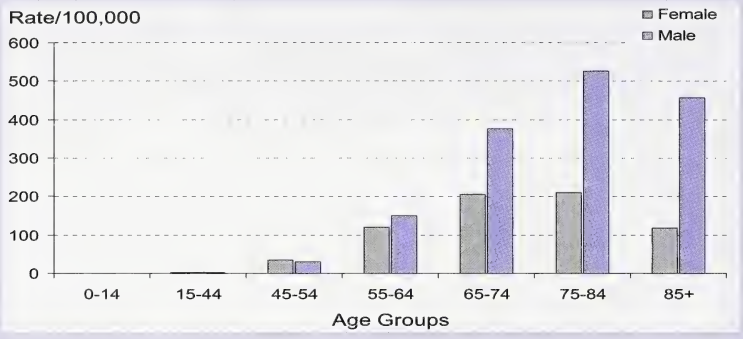
*3 year moving averages

The declining trend in lung cancer incidence in males reflects their decrease in smoking prevalence 20 to 30 years ago. Over 80% of lung cancers are attributed to tobacco exposure.[1] In 1966, 47% of Alberta males were smokers compared to 36% in 1979.[2] The incidence of lung cancer in males dropped from 77 per 100,000 in 1988 to 67 per 100,000 in 1996. Note, however, that the number of cases and the rates are still substantially higher than in women, because the peak smoking rate for men was higher than the peak smoking rate for women.

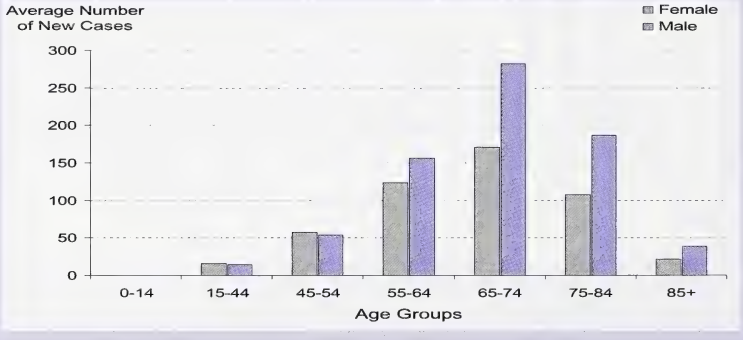
In 1996, the rate of smoking in men dropped to 31% and in 1999 this rate dropped to 27%.[3, 4] This decrease in smoking should be reflected in continued falling incidence rates of lung cancer in the years to come. However, further reductions in smoking rates would further the decline in lung cancer incidence.

[1] Roth, Jack A., James D, Cox, and Waun Ki Hong, *Lung Cancer, 2nd Edition (* London: Blackwell Science Inc., 1998.) 2.
[2] Health and Welfare Canada, *Smoking Habits of Canadians 1965-1979* (Ottawa, 1980) 20.
[3] Health Canada, *National Population Health Survey Highlights 1996/97* (Ottawa, 1999).
[4] Health Canada, *Canadian Tobacco Use Monitoring Survey* (Ottawa, 1999) Table 3.

Age-Specific Incidence Rates for Invasive Lung Cancer, Alberta 1996 (average of 1995-1997)



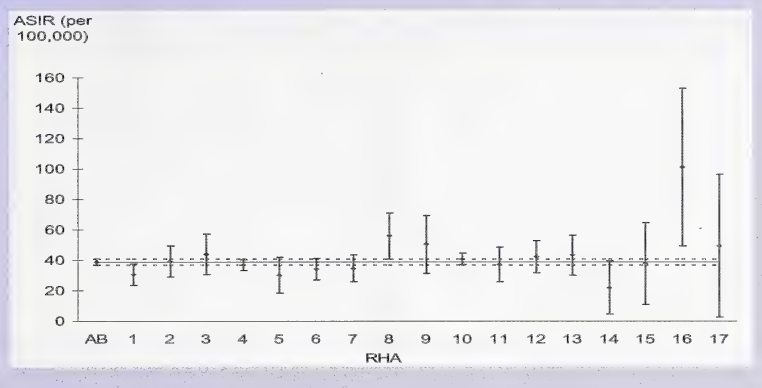
New Cases by Selected Age Groups for Invasive Lung Cancer, Alberta 1996 (average of 1995-1997)



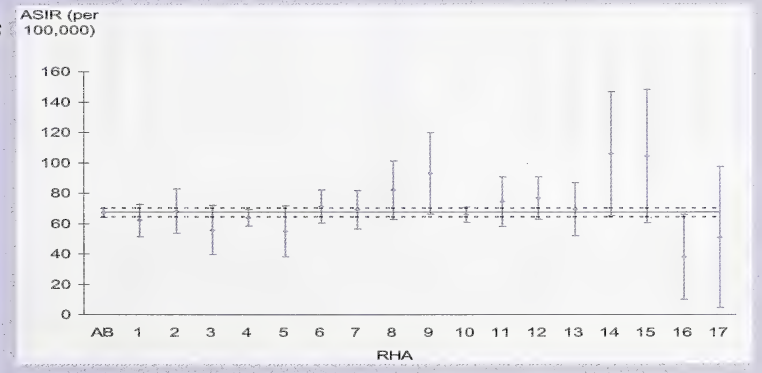
The age specific rate for lung cancer peaks for males in the 75-84 year age group while for females the rates are the highest in the 65-74 and 75-84 year old age groups. In males the age specific rates for the 45-54, 55-64 and the 65+ year age groups have increased over the last 8 years. As with many cancers, the largest number of lung cancer cases occurs in the 65-74 year age group for both sexes.

Age-Standardized Incidence Rates (ASIR) by RHA with 95% Confidence Intervals (CIs) for Invasive Lung Cancer, 1996 (average of 1995-1997)

Females



Males

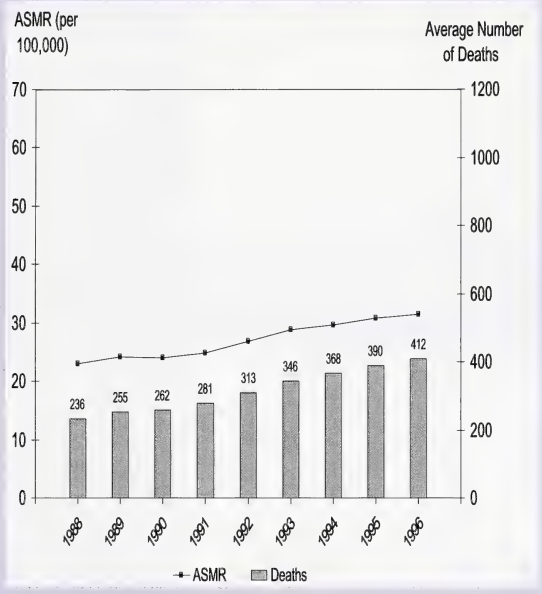


There is variability in lung cancer incidence among the smaller RHAs, but note the large confidence intervals. Since lung cancer incidence is related to smoking patterns, the variation of rates may be a reflection of past smoking patterns.

LUNG CANCER - MORTALITY

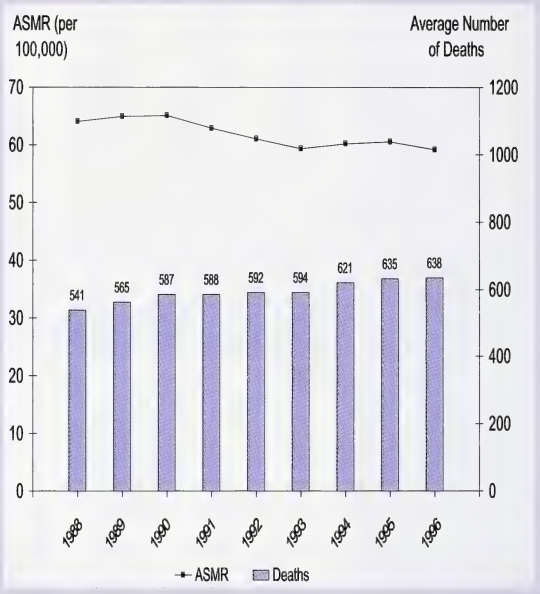
Age-Standardized Mortality Rates (ASMR)* and the Number of Deaths for Invasive Lung Cancer, Alberta (1988-1996)

Females



*3 year moving averages

Males

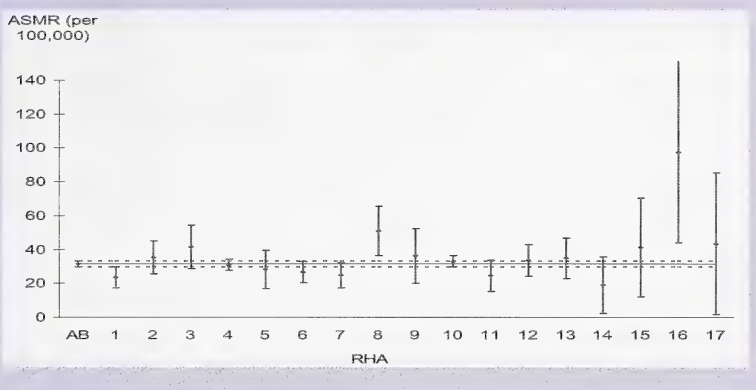


*3 year moving averages

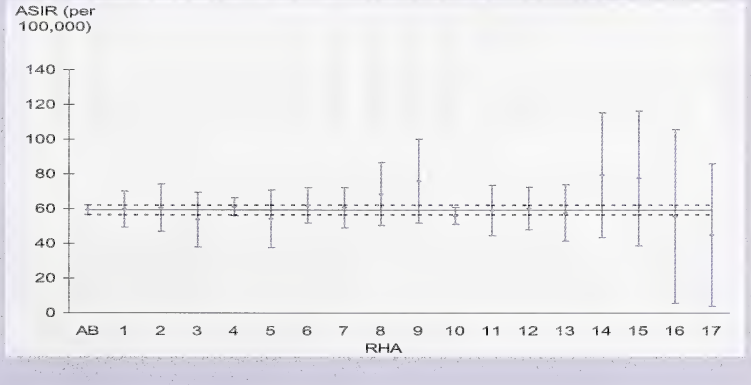
The mortality trends for lung cancer for both females and males are very similar to incidence trends. Lung cancer still has quite a high death rate; therefore the number of deaths per year is almost as high as the number of new cases. Note that even though male mortality rates are falling they are still higher than female mortality rates. In 1994, for the first time, lung cancer exceeded breast cancer as the leading cause of cancer death in Alberta women.

Age-Standardized Mortality Rates (ASMR) by RHA with 95% Confidence Intervals (CIs) for Invasive Lung Cancer 1996 (average of 1995-1997)

Females



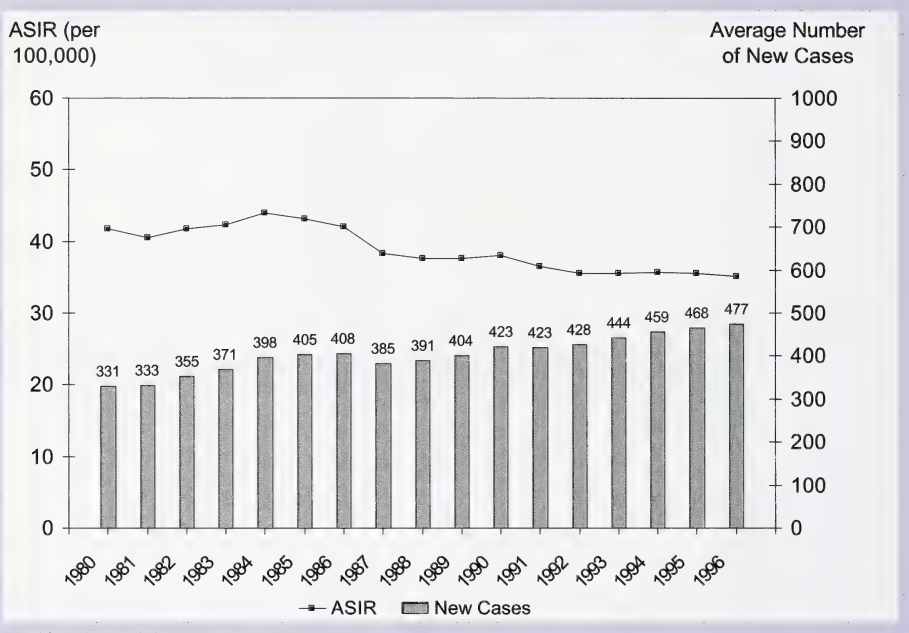
Males



The patterns of the RHA mortality rates for lung cancer are similar to the age-standardized incidence patterns.

COLORECTAL CANCER - INCIDENCE

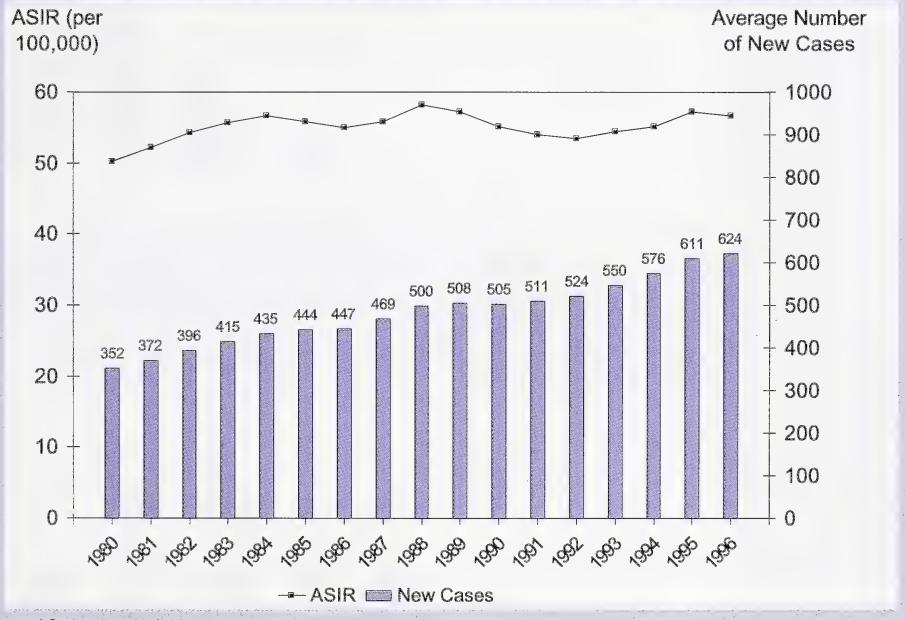
Age-Standardized Incidence Rates (ASIR) and New Cases for Invasive Colorectal Cancer, Females, Alberta (1980-1996)*



*3 year moving averages

The age-standardized incidence rates for colorectal cancer in females gradually decreased between 1980 and 1996. The reasons for changes in trends in colorectal cancer incidence are not well understood, but some evidence suggests that lifestyle changes such as diet may have contributed to the decline.

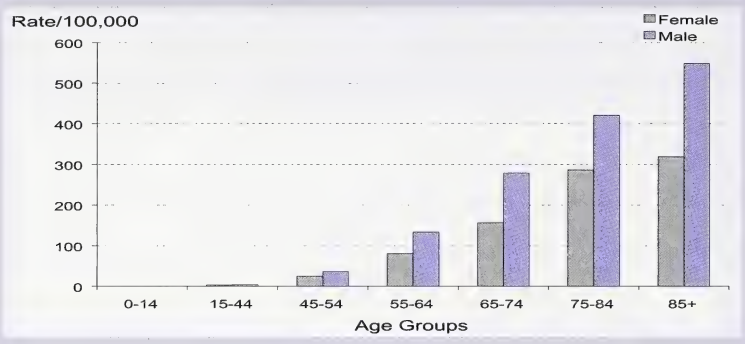
Age-Standardized Incidence Rates (ASIR) and New Cases for Invasive Colorectal Cancer, Males, Alberta (1980-1996)*



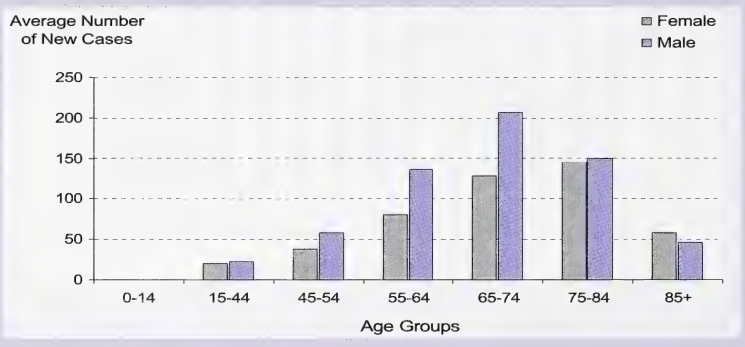
*3 year moving averages

The age-standardized incidence rates for colorectal cancer in males did not show the same downward trend as female rates between 1980 and 1996. The reasons for this difference are not well understood.

Age-Specific Incidence Rates for Invasive Colorectal Cancer, Alberta 1996 (average of 1995-1997)



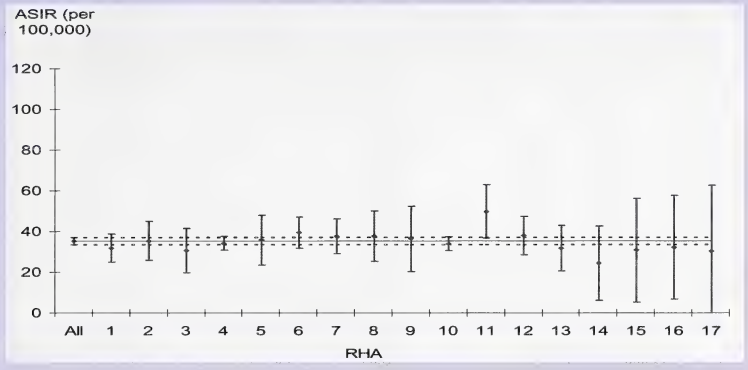
New Cases by Selected Age Groups for Invasive Colorectal Cancer, Alberta 1996 (average 1995-1997)



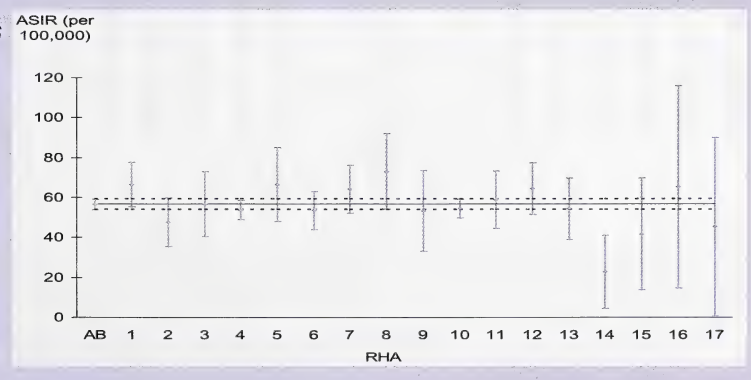
Age-specific incidence rates for invasive colorectal cancer increase with age. The number of cases peaks in the 65-74 year age group for males and in the 75-84 year age group in females. Males have higher incidence rates and numbers than females for all age groups except for the 85+ year age group where females have slightly more cases, although female rates are lower.

Age-Standardized Incidence Rates(ASIR) by RHA with 95% Confidence Intervals (CIs) for Invasive Colorectal Cancer 1996 (average of 1995-1997)

Females



Males

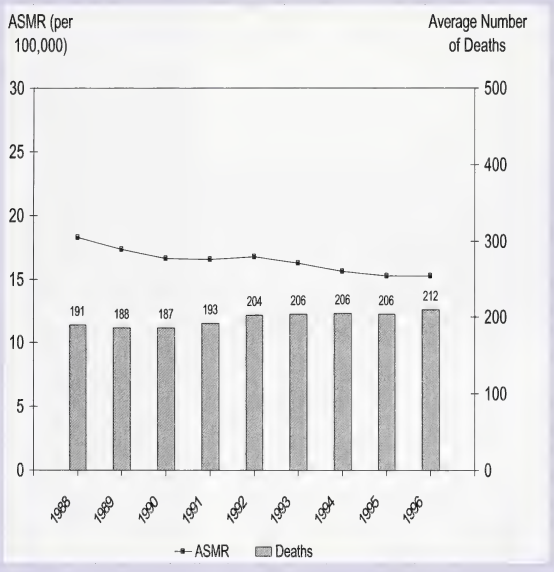


Female rates for colorectal cancer are quite comparable across RHAs, while the rates for males are more scattered.

COLORECTAL CANCER - MORTALITY

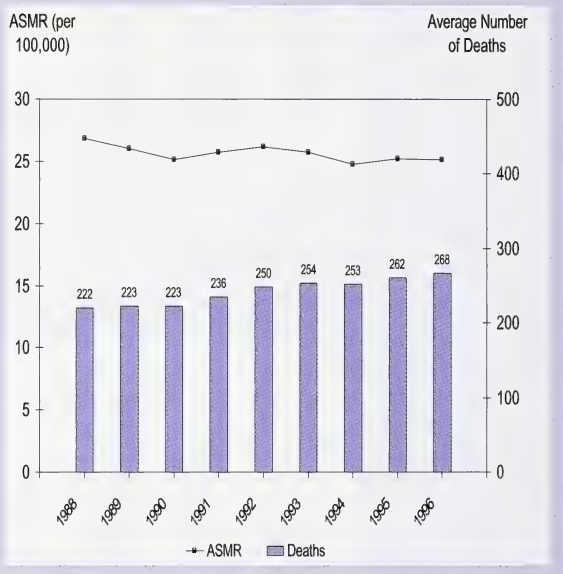
Age-Standardized Mortality Rates (ASMR) and the Number of Deaths for Invasive Colorectal Cancer, Alberta (1988-1996)*

Females



*3 year moving averages

Males



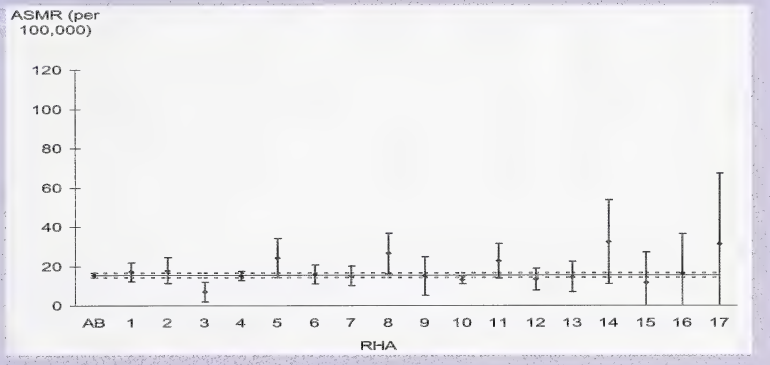
*3 year moving averages

Both sexes show the same declining pattern in colorectal cancer mortality rates, even though incidence only decreased in females.

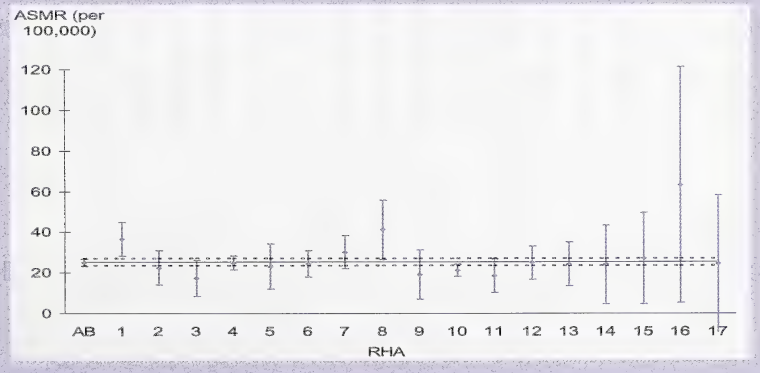
Note that male mortality rates are still higher than female rates. The age specific patterns for mortality from colorectal cancer are similar to those for incidence. However, the number of deaths that occur in a given year is approximately 45% of the number of new cases.

Age-Standardized Mortality Rates (ASMR) by RHA with 95% Confidence Intervals (CIs) for Invasive Colorectal Cancer 1996 (average of 1995-1997)

Females



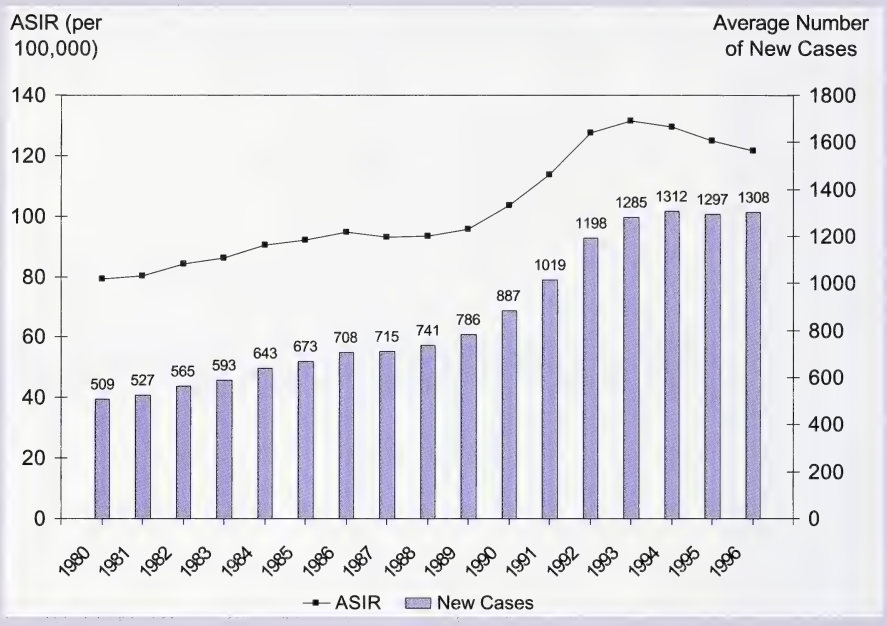
Males



There is little variability overall in the age-standardized mortality rates among men and women.

PROSTATE CANCER - INCIDENCE

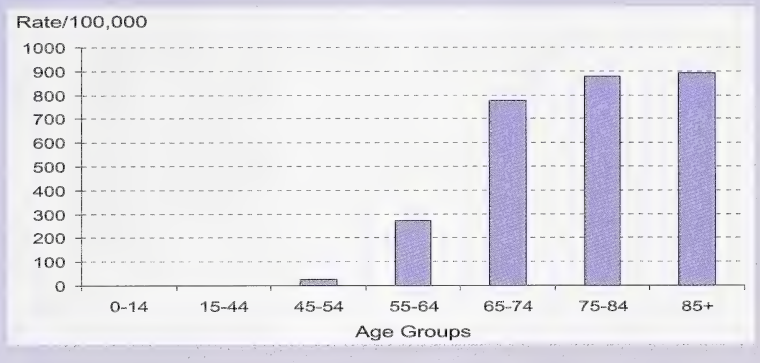
Age-Standardized Incidence Rates (ASIR)* and New Cases for Invasive Prostate Cancer, Males, Alberta (1980-1996)



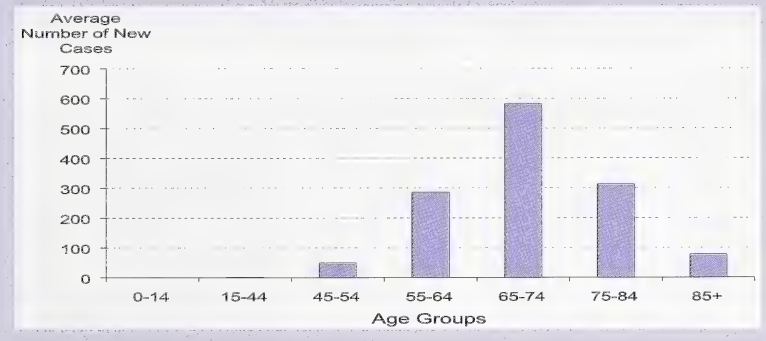
*3 year moving averages

Increased incidence of prostate cancer prior to 1990 is partly due to increased detection of cancers following trans-urethral resection of the prostate (TURP) for suspected benign prostatic hypertrophy. The sharp increase since 1990 is predominantly the result of increased early detection using PSA (prostate specific antigen) testing, which became available in Alberta in 1989. The testing resulted in early detection of clinically unsuspected cancers, advancing the time of diagnosis. This pattern is seen throughout Canada. This trend will be monitored.

Age Specific Incidence Rates for Invasive Prostate Cancer, Males, Alberta 1996 (average of 1995-1997)



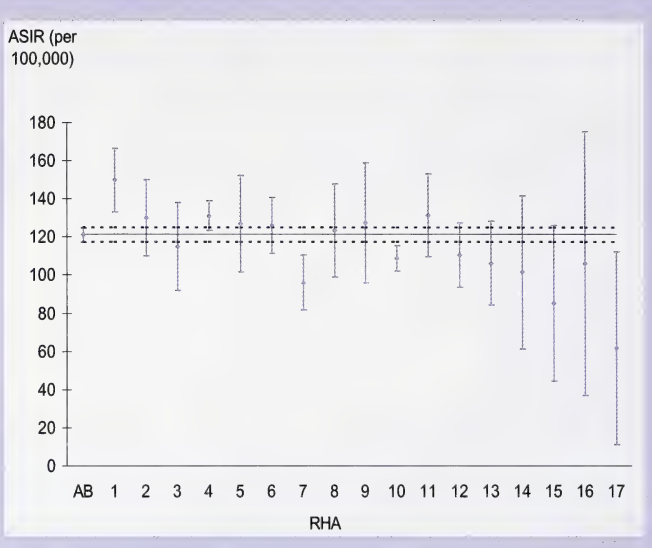
New Cases by Selected Age Groups for Invasive Prostate Cancer, Males, Alberta 1996 (average of 1995-1997)



Prostate cancer incidence is strongly linked with age. Seventy-four percent (74%) of new cases in 1996 occurred in men over 64 years of age.

Age-Standardized Incidence Rates (ASIR) by RHA with 95% Confidence Intervals (CIs) for Invasive Prostate Cancer, Males 1996 (average of 1995-1997)

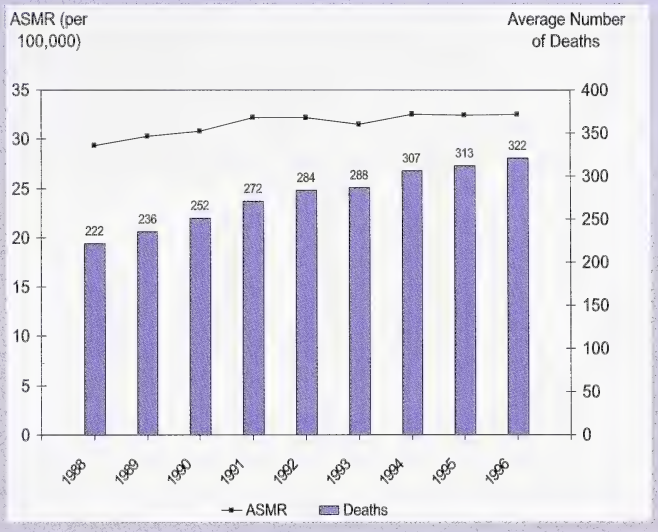
Incidence seems to be higher in the south and lower in the north. This may reflect different patterns of PSA testing in the province, but other explanations are also possible. Prostate cancer incidence has changed dramatically since 1990 and this is believed to be because of the influence of PSA testing as discussed on page 26. Trends will continue to be monitored by the Alberta Cancer Registry.



PROSTATE CANCER - MORTALITY

Age-Standardized Mortality Rates (ASMR)* and the Number of Deaths for Invasive Prostate Cancer, Males, Alberta (1988-1996)

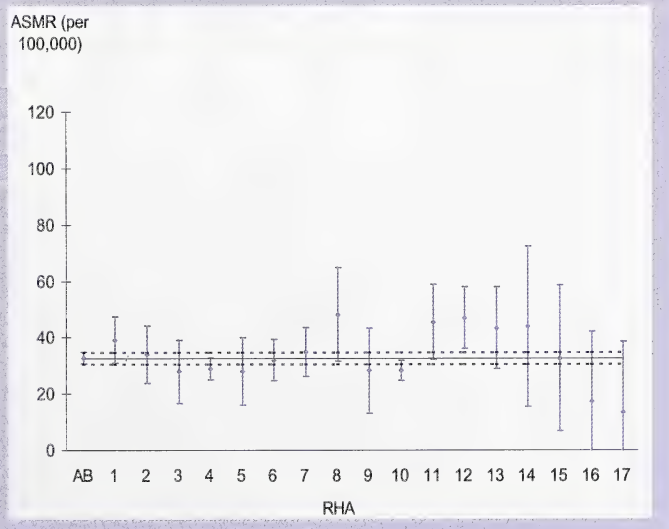
Despite the sharp increase in prostate cancer incidence from 1990-1993, there has not been an associated change in mortality rates.



*3 year moving averages

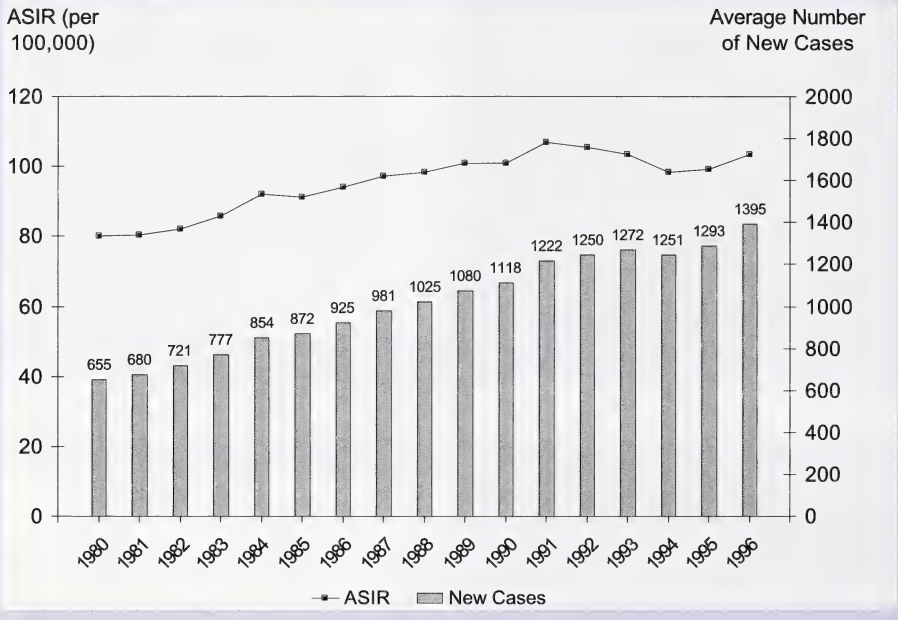
Age-Standardized Mortality (ASMR) Rates by RHA with 95% Confidence Intervals (CIs) for Invasive Prostate Cancer, Males 1996 (average of 1995-1997)

There is little variation among the RHAs in mortality, in contrast to the variability in incidence. This adds strength to the suggestion that the higher incidence in some areas may be due to differences in detection patterns.



BREAST CANCER - INCIDENCE

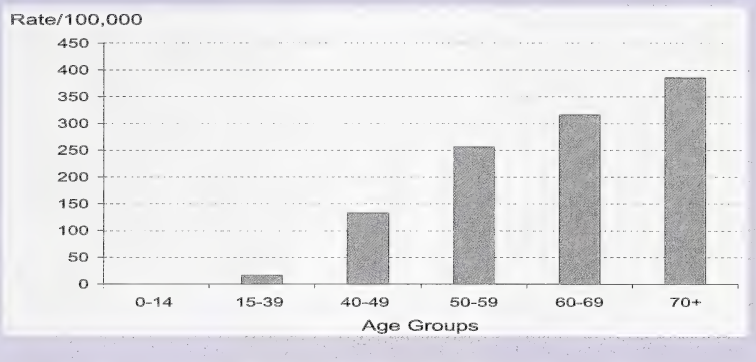
Age-Standardized Incidence Rates (ASIR)* and New Cases for Invasive Breast Cancer, Females, Alberta (1980-1996)



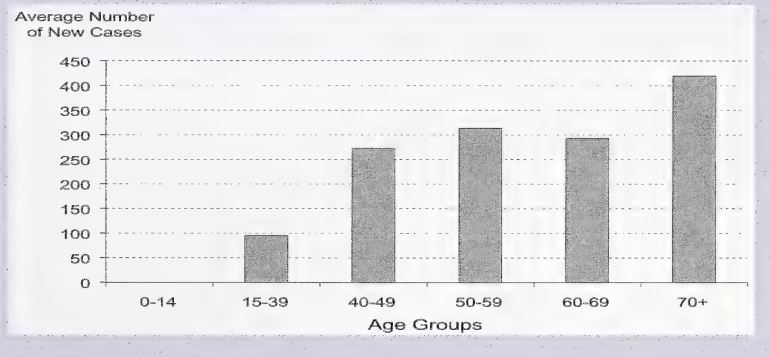
*3 year moving averages

Incidence rates for breast cancer steadily increased until the mid 1990s when the rates began to stabilize. This increase may reflect an increase in screening mammography that occurred in the late 1980s and early 1990s. More cancers were found earlier than would have been previously detected, but this effect of screening has now levelled off. However, even without the effect of mammography screening there has been an underlying gradual increase in breast cancer rates that goes back for many years. The reason for this is not well understood.

Age-Specific Incidence Rates for Invasive Breast Cancer, Females, Alberta 1996 (average of 1995-1997)



New Cases by Selected Age Groups for Invasive Breast Cancer, Females, Alberta 1996 (average of 1995-1997)

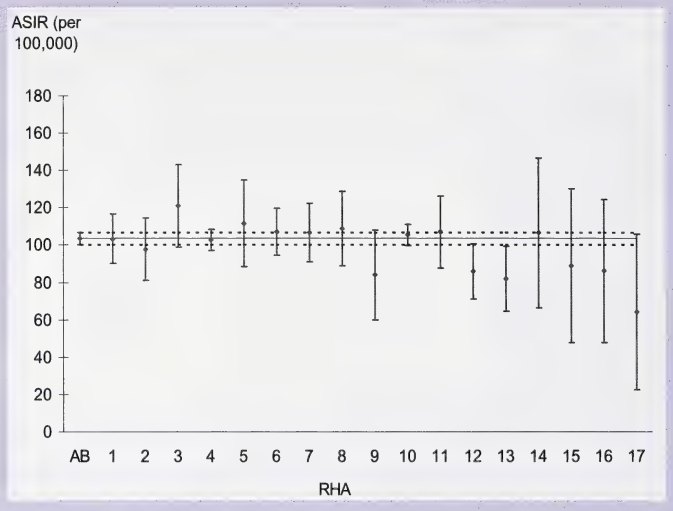


Incidence rates for breast cancer are the highest in older women, peaking in the 70+ age group. However, because the population of women under 60 is so much larger, in part due to the baby boom population, about half of the cases seen now occur in women under 60.

Note that the age groups selected for breast cancer are different from the age groups selected for other adult cancers in this document. The age groups for breast cancer are selected to indicate rates and new cases for women in the target screening mammography age range of 50 to 69 years.

Age-Standardized Incidence Rates (ASIR) by RHA with 95% Confidence Intervals (CIs) for Invasive Breast Cancer, Females 1996 (average of 1995-1997)

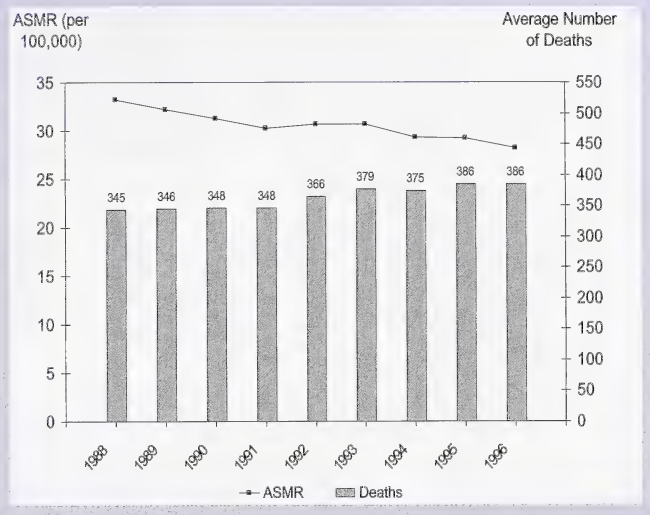
There is variability in breast cancer incidence among the smaller RHAs, but note the large confidence intervals.



BREAST CANCER - MORTALITY

Age-Standardized Mortality Rates (ASMR) and the Number of Deaths for Invasive Breast Cancer, Females, Alberta (1988-1996)*

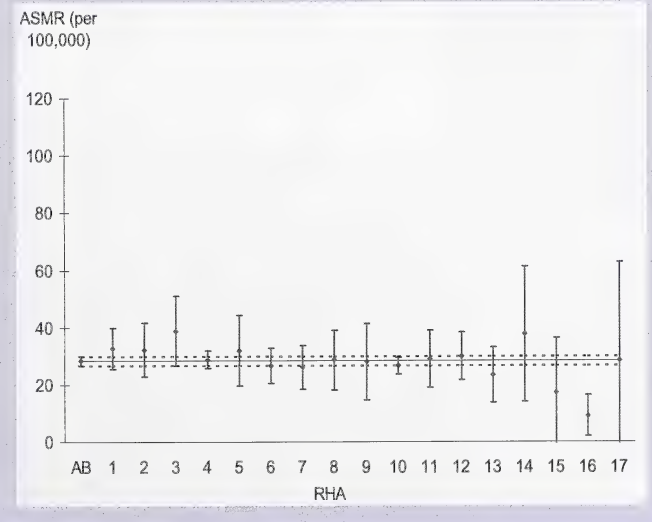
Breast cancer mortality rates are gradually decreasing. Further research is needed to determine whether early detection through mammography screening, improved treatment or other factors are responsible for this decline. The fact that incidence rates increased while mortality rates decreased reflects better survival for diagnosed cases. The survival rate is much higher for cancers found at an earlier stage.



*3 year moving averages

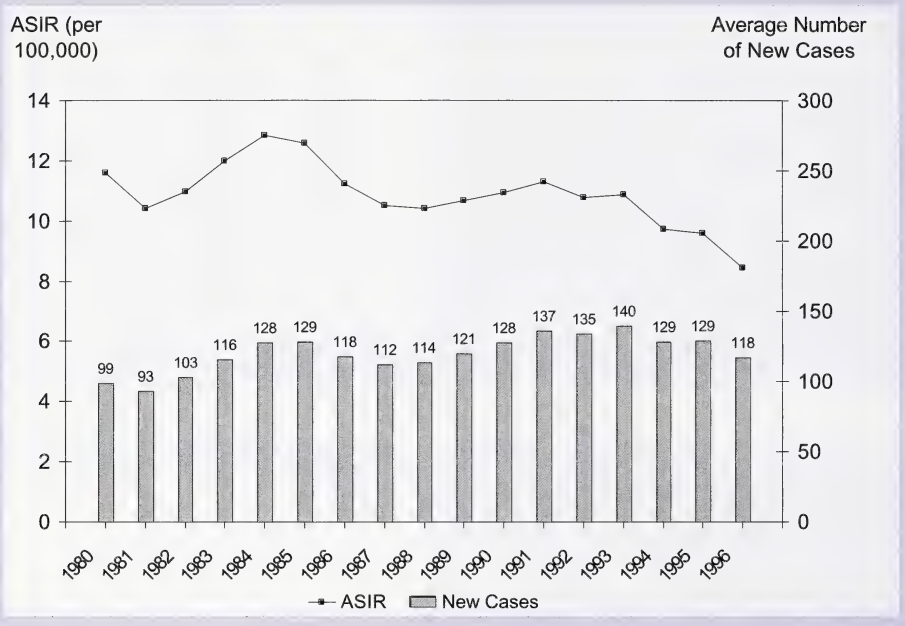
Age-Standardized Mortality Rates (ASMR) by RHA with 95% Confidence Intervals (CI) for Invasive Breast Cancer, Females 1996 (average of 1995-1997)

There is little variation of breast cancer mortality rates across the RHAs.



CERVICAL CANCER - INCIDENCE

Age-Standardized Incidence Rates (ASIR) and New Cases for Invasive Cervical Cancer, Females, Alberta (1980-1996)*



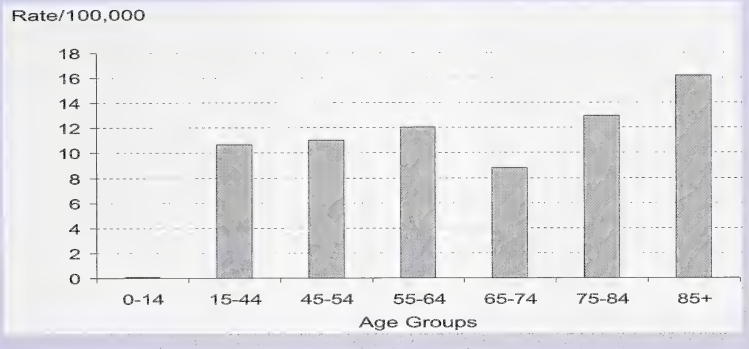
*3 year moving averages

Age-standardized incidence rates for cervical cancer have been decreasing. Pap smear screening can actually prevent the incidence of invasive cervical cancer and is likely responsible for most of the decrease. Pap smears identify early changes in cervical cells, thus allowing for early treatment. In 1996 in Alberta, 1110 cases of cervical carcinoma in-situ (lesions that have not spread beyond the surface of the cervix) were reported.

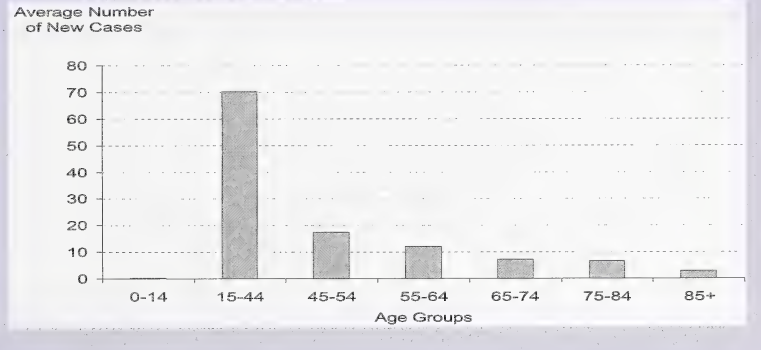
Most cases of cervical cancer occur in women who have either never had a Pap test or have not had one recently.[1] An organized cervical cancer-screening program could further reduce incidence by identifying and reaching out to groups of women with lower screening rates.

[1] Statistics Canada, "Falling Short of Pap Test Guidelines", *Health Reports*, Summer 1998; 10 (1) 11.

Age-Specific Incidence Rates for Invasive Cervical Cancer, Females, Alberta 1996 (average of 1995-1997)



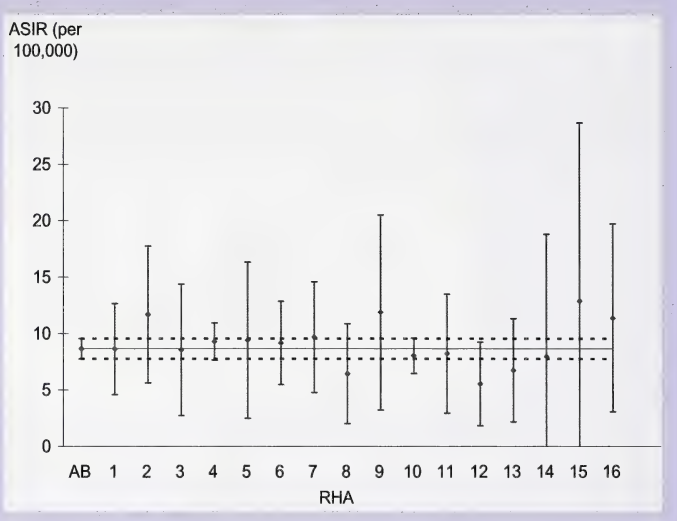
New Cases by Selected Age Groups for Invasive Cervical Cancer, Females, Alberta 1996 (average of 1995-1997)



Unlike the 4 major types of cancer, for cervical cancer a significant proportion of cases occurs in the younger age groups and there is not as dramatic a difference in rates across the adult age groups.

Age-Standardized Incidence Rates (ASIR) by RHA with 95% Confidence Intervals (CIs) for Invasive Cervical Cancer, Females 1996 (average of 1995-1997)

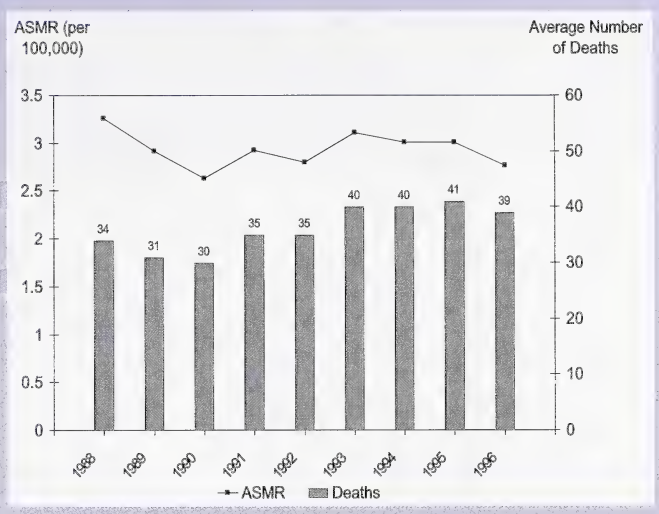
There is little variation in cervical cancer incidence rates across the province.



CERVICAL CANCER - MORTALITY

Age-Standardized Mortality Rates (ASMR)* and the Number of Deaths for Invasive Cervical Cancer, Females, Alberta (1988-1996)

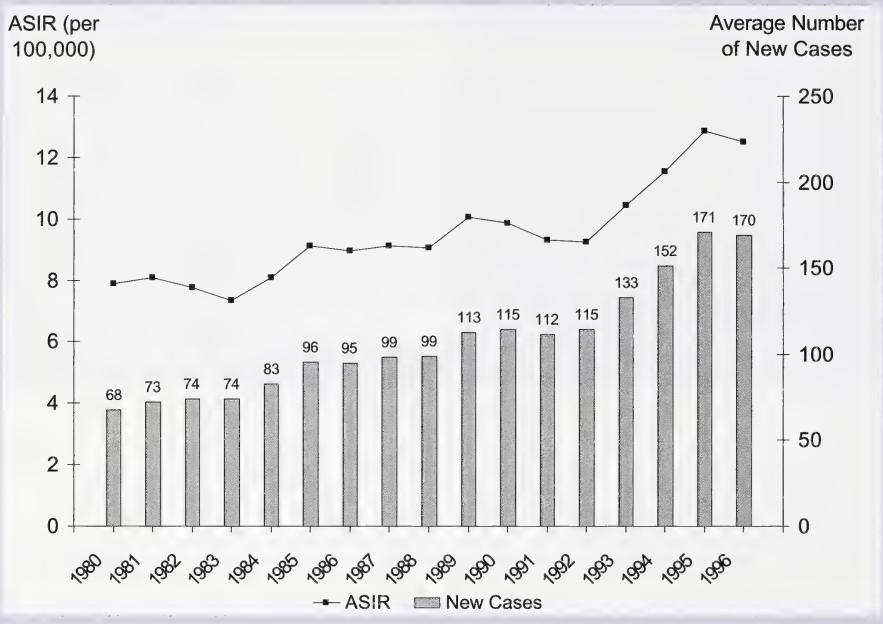
Cervical cancer has a very good prognosis when detected and treated early; therefore the mortality rates are considerably lower than the incidence rates. Nevertheless, about 40 Alberta women die each year from cervical cancer and many of those deaths could be prevented. Regional mortality rates are not presented for cervical cancer because year-to-year fluctuations can be quite erratic with such small numbers.



*3 year moving averages

MELANOMA - INCIDENCE

Age-Standardized Incidence Rates (ASIR) and New Cases for Invasive Melanoma, Females, Alberta (1980-1996)*

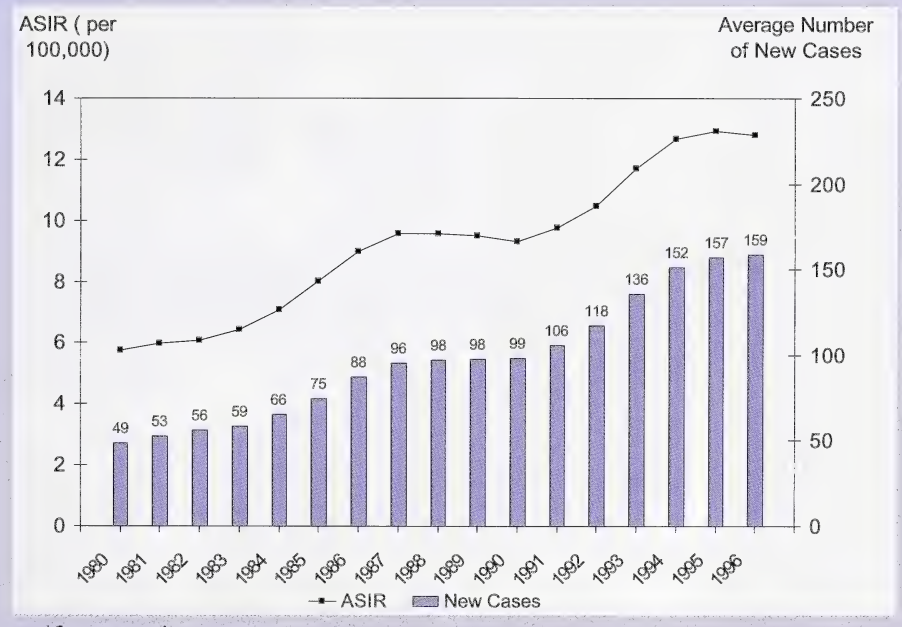


*3 year moving averages

Melanoma skin cancer showed a sharp increase from 1992-1995. The increase in incidence of this cancer could be largely due to a change in coding procedures. Prior to 1993 melanoma skin cancers were coded using rules developed locally in Alberta. In 1993 the Alberta Cancer Registry adopted the NAACCR coding rules as developed by the SEER** program – this method of coding captured more cancers. The cancer rates stabilized in 1996, as the effect of the 1993 coding changes had leveled off. Mortality data are not included for melanoma skin cancer, because even though it is by far the most serious form of skin cancer, the survival rate is very high when detected and treated early.

***SEER = Surveillance, Epidemiology, & End Results Program*

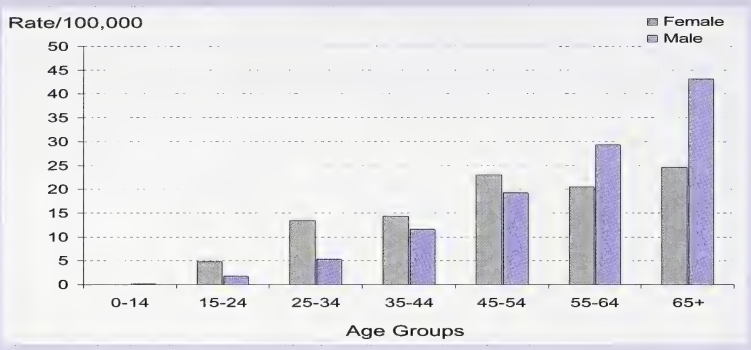
Age-Standardized Incidence Rates (ASIR) and New Cases for Invasive Melanoma, Males, Alberta (1980-1996)*



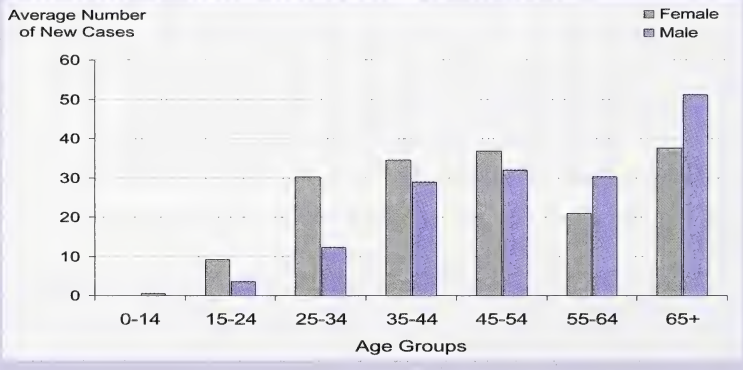
*3 year moving averages

Melanoma shows a similar increase in incidence for men as for women in the early 1990s. Both men and women had a rate of 13 cases per 100,000 in 1996. An explanation for the trends in melanoma skin cancer is found on the previous page.

Age-Specific Incidence Rates for Invasive Melanoma, Alberta 1996 (average of 1995-1997)



New Cases by Selected Age Groups for Invasive Melanoma, Alberta 1996 (average of 1995-1997)



The age-specific rates for melanoma increase with age for males, but for females the rates are not so closely linked with age as the major 4 cancers. Females have higher rates than males in the younger age groups (less than 55 years) while males have higher rates than females at age 55 years or older. The difference in age groups could be related to differences in exposure to sunlight, and changing styles of clothing for outdoor recreation.[1]

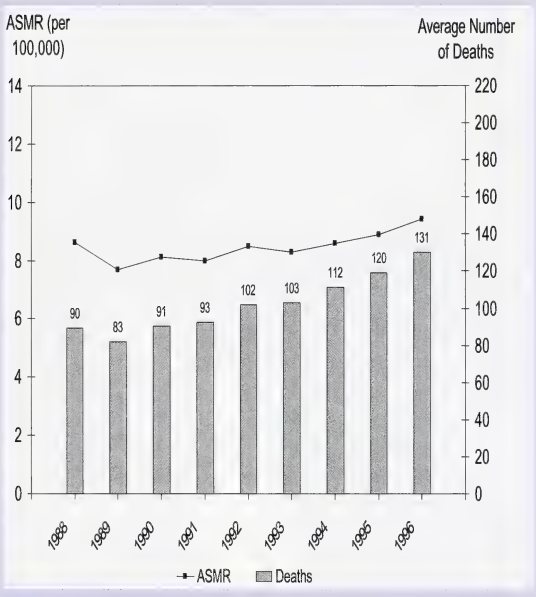
The numbers of cases that occur from 25 to 54 years of age is fairly consistent for females. Female cases outnumber males from 15 to 54 years of age. In the older age groups, the number of cases in males is larger than that of females. There is no RHA comparison for melanoma skin cancer because the numbers are too small.

[1] Statistics Canada, "Changing Trends in Melanoma Incidence and Mortality", *Health Reports*, Autumn 1998; 10 (2) 35.

PANCREAS CANCER - MORTALITY

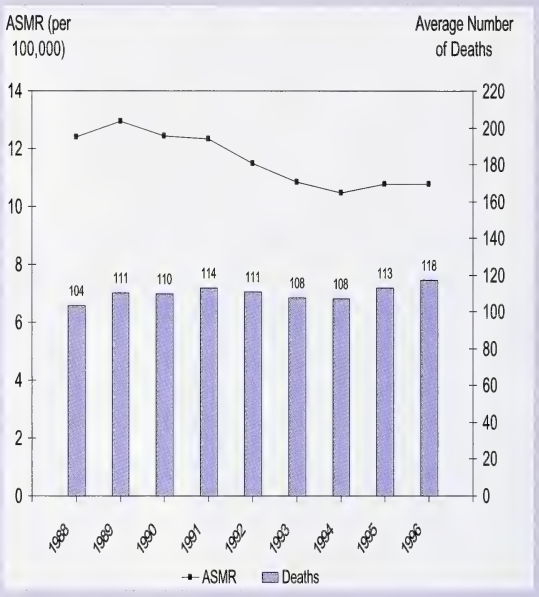
Age-Standardized Mortality Rates (ASMR) and the Number of Deaths for Invasive Pancreas Cancer, Alberta (1988-1996)*

Females



*3 year moving averages

Males

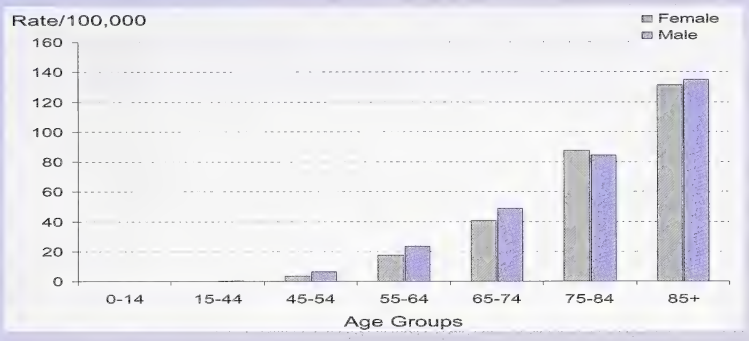


*3 year moving averages

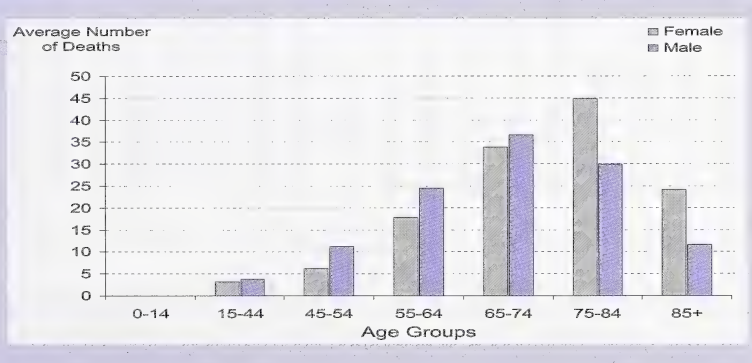
Incidence data are not included for cancer of the pancreas because mortality is almost identical to incidence. Mortality for cancer of the pancreas is gradually increasing in females while it is decreasing in males. Although this cancer in not as common as many others, in 1997 it was the 5th leading cause of cancer deaths in Alberta due to its low survival rate. There is little variation in mortality rates for pancreatic cancer among the RHAs. The only well-established risk factor of significance is smoking. [1] The cause for most cases of pancreatic cancer, however, is not known.

[1] Stephens, F. O., "The Increased Incidence of Cancer of the Pancreas.", *Australian New Zealand Journal of Surgery. May 1999; 69(5) 331.*

Age-Specific Mortality Rates for Invasive Pancreas Cancer, Alberta 1996 (average of 1995-1997)



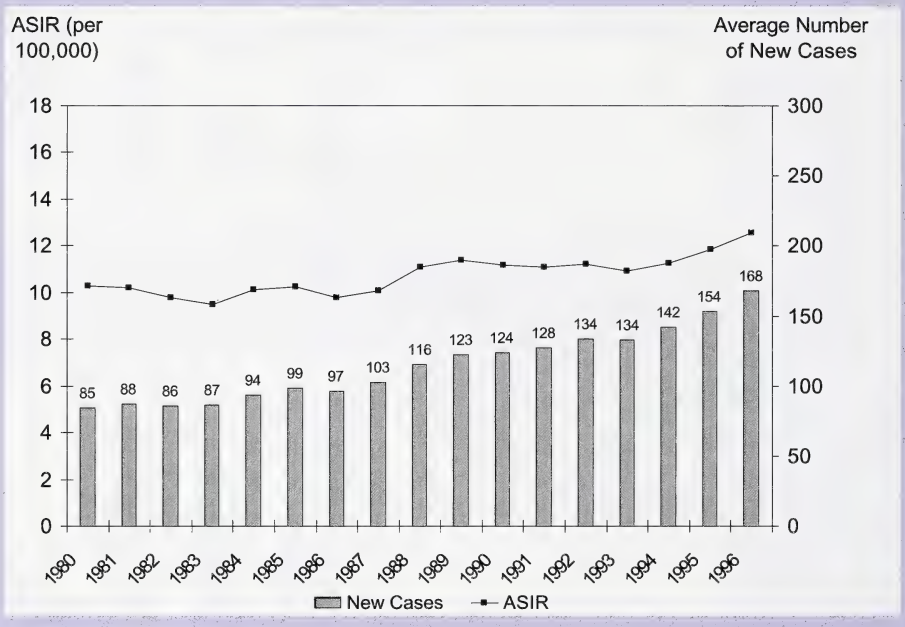
Number of Deaths for Selected Age Groups for Invasive Pancreas Cancer, Alberta 1996 (average of 1995-1997)



The age-specific mortality rates for pancreatic cancer are very similar in men and women, and increase steadily with age.

NON-HODGKIN'S LYMPHOMA - INCIDENCE

Age-Standardized Incidence Rates (ASIR)* and New Cases for Non-Hodgkin's Lymphoma, Females, Alberta (1980-1996)



*3 year moving averages

Non-Hodgkin's lymphoma age-standardized incidence rates have been increasing in females. This is similar to the pattern seen in Canada as a whole. Little of the increase in non-Hodgkin's lymphoma can be explained by known viral or environmental risk factors.[1] Mortality data are not included for non-Hodgkin's lymphoma because there are so few deaths per year.

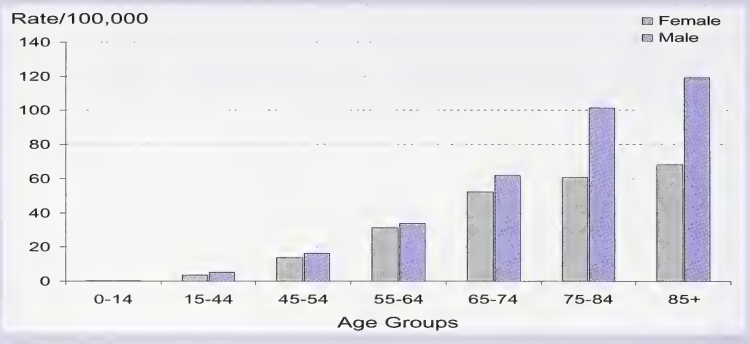
[1] Camelos, George P., Andrew Lister and Jeffrey Sklar. *The Lymphomas (Philadelphia: W.B.. Saunders Company, 1998) 58.*

Age-Standardized Incidence Rates (ASIR) and New Cases for Non-Hodgkin's Lymphoma, Males, Alberta (1980-1996)*

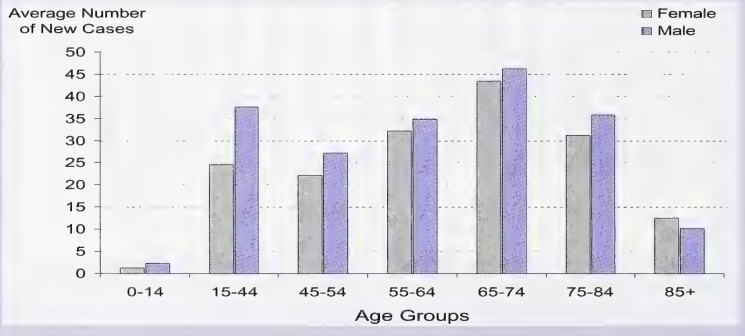
*3 year moving averages

Non-Hodgkin's lymphoma age standardized incidence rates have also increased in males. This is similar to the pattern seen in Canada as a whole. Males had a slightly higher rate of 17 cases per 100,000 in 1996 compared to 13 per 100,000 in females for the same year. See the previous page for more explanation about the trends in non-Hodgkin's lymphoma.

Age-Specific Incidence Rates for Non-Hodgkin's Lymphoma, Alberta 1996 (average of 1995-1997)



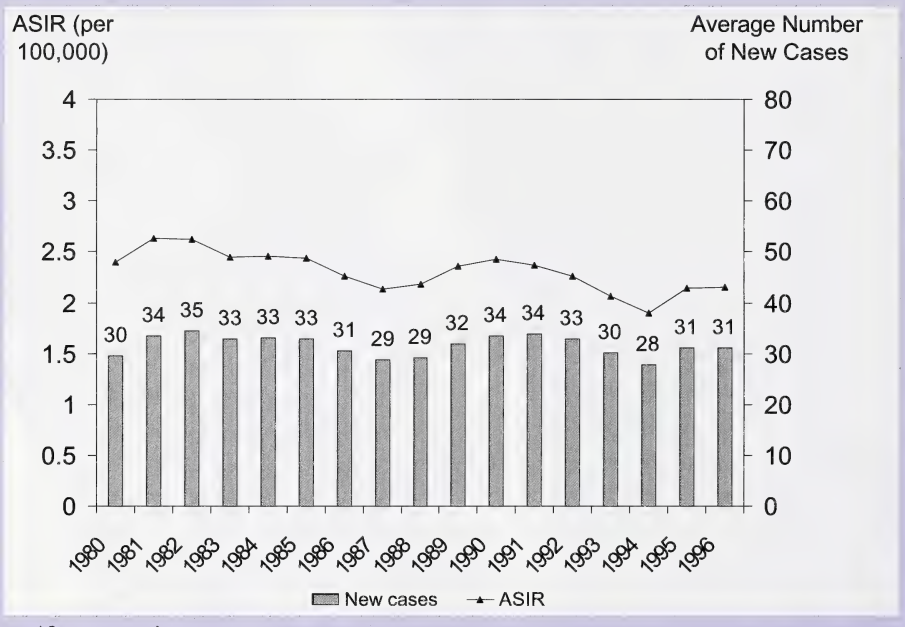
New Cases by Selected Age Groups for Non-Hodgkin's Lymphoma, Alberta 1996 (average of 1995-1997)



The risk for developing non-Hodgkin's lymphoma increases with age, although not as sharply as other cancers.

PEDIATRIC CANCER - INCIDENCE

Age-Standardized Incidence Rates (ASIR)* and New Cases for Pediatric Invasive Cancer (less than 15 years of age), Females, Alberta (1980-1996)

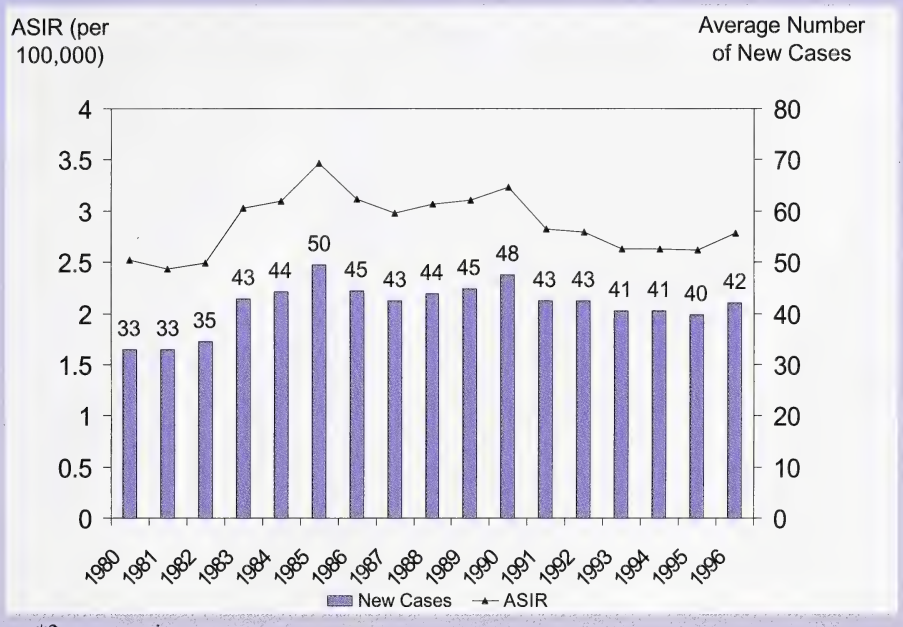


*3 year moving averages

Cancer is much less common in children than in adults. The types of cancer seen in children also differ from the common cancers in adults. The most common cancers in Alberta children are leukemia and lymphoma.

The causes of cancer in children and adults appear to differ. Lifestyle factors such as nutrition appear to play less of a role in pediatric cancer.

Age-Standardized Incidence Rates (ASIR) and New Cases for Pediatric Invasive Cancer (less than 15 years of age), Males, Alberta (1980-1996)*



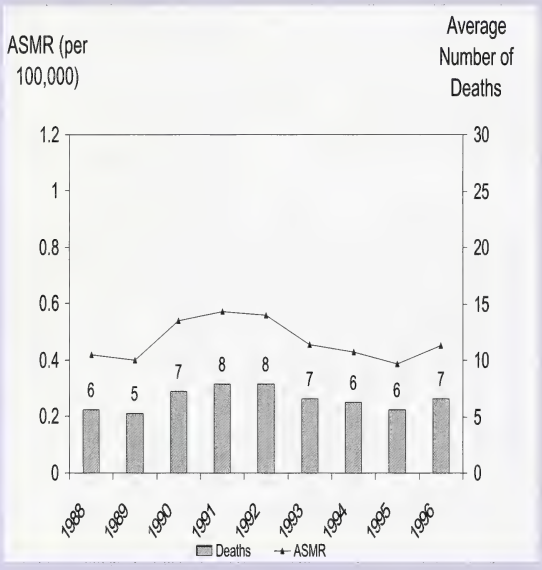
*3 year moving averages

Cancer occurs slightly more frequently among boys (3/100,000) than girls (2/100,000). See the previous page for more information on pediatric invasive cancer.

PEDIATRIC CANCER - MORTALITY

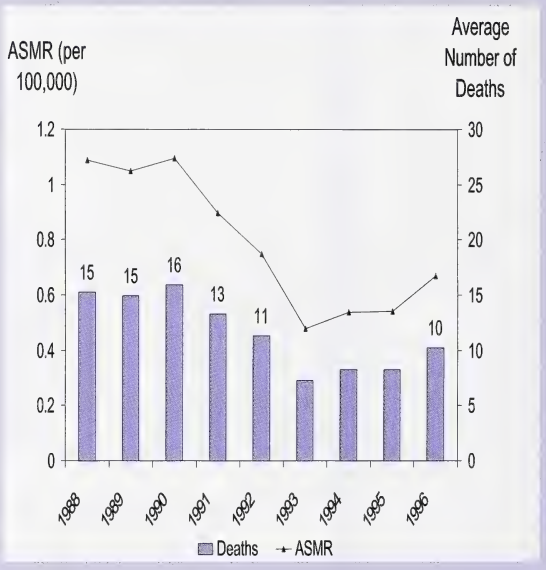
Age-Standardized Mortality Rates (ASMR)* and the Number of Deaths for Pediatric Invasive Cancer (less than 15 years of age), Alberta (1988-1996)

Females



*3 year moving averages

Males



*3 year moving averages

Many cancers in children are successfully treated. In 1996 less than one out of every 100,000 Alberta children died of cancer. There is a high variability from year to year because the numbers are so small.

Over the past 20 years, there has been a marked improvement in survival for children with cancer, due to advances in treatment resulting from cancer research.

Note that the ASMR axis only goes up to 1.2 cases per 100,000, so the difference in mortality rates between females and males is very small in actual numbers.

Technical Report

Data Preparation

The data for this report comes from the Alberta Cancer Registry. The Alberta Cancer Registry, of the Alberta Cancer Board's Division of Epidemiology, Prevention and Screening, records and maintains data on all new primary cancers and cancer deaths occurring in the province, as mandated by the Cancer Programs Act of Alberta. The Cancer Registry tries to capture all invasive and in situ cancers diagnosed amongst Albertans as well as borderline conditions and central nervous system tumours that have been seen at an Alberta Cancer Board facility.

The Alberta Cancer Registry, established in 1942, began compiling population-based data in 1950. However, due to consistent coding, data entry and data retrieval techniques, data starting from the 1970s are considered more reliable. At that time, the Registry became patient based, rather than tumour based.

The Alberta Cancer Registry operates out of two centres and a satellite office. The Calgary centre is responsible for the southern half of the province, while the Edmonton centre maintains data collection for the northern half of the province.

The Alberta Cancer Registry has the distinction of receiving **gold certification** from The North American Association of Central Cancer Registries (NAACR) in 1998 and 1999. NAACR began its certification process in 1998. The certification process looked at data collected over the time period in this report. The gold certification held by Alberta Cancer Registry is the highest level of certification available.

Sources of Data

Population

The population data for the provincial statistics used in this report were based on the Statistics Canada 1991 Census, conducted every five years and are corrected for census undercounts.

Residence

All data in this report relate only to those people who were resident in Alberta at the time of diagnosis or death. The RHA of residence is determined primarily from the postal code. Alberta Health and Wellness

has supplied a postal code - RHA conversion file (Feb 1999) for the most recent RHA boundaries. The Alberta Cancer Registry has also developed a conversion file of community name and RHA.

For incidence, the Standard Geographic Code or the Postal Code determines residence. Standard Geographic Code is available for 99.7% of cases and postal code for 98.3% of all cases registered (resident and non-resident).

For mortality, residence is determined from the death certificate. RHA of residence is defined from postal code and/or town of residence as recorded on the death certificate. Approximately 80% of death certificates have a postal code and only one or two cases per year are missing town. Where both postal code and town are recorded on the death certificate there is less than 0.5% disagreement on RHA designation. Agreement between postal code and town (where both are recorded) as to resident/non-resident of Alberta is almost 100%.

Incidence

Provincial incidence trends are presented for the period 1980-1996. The Alberta Cancer Registry learns of new cancers from a variety of sources. Laboratories throughout the province send a copy of each pathology report with a diagnosis of cancer to the nearest Alberta Cancer Board facility. The reports are then available to the Registry. Other items that also may be received are operative reports, discharge summaries and X-ray reports or scans.

All incidence tables and graphs represent new cancers and not the number of Albertans with cancer, as each patient may have more than one cancer.

Mortality

Provincial mortality trends are presented for the period 1988-1996. Mortality data prior to 1988 are not presented because of problems with missing data on cause of death.

Alberta Vital Statistics sends the Registry an electronic file with a list of every death occurring in Alberta. These data are linked to the Registry to identify cancer cases that have died. Information on the date and cause of death is entered. Autopsy data, if different from the original diagnosis, is also entered. Cancer Registry staff may modify the death cause listed

on the death certificate based on information available in the patient's medical record (see: 'Coding' section). Less than one percent of new cancer cases are registered through the death certificate only.

Regional Statistics

Regional statistics are based on an average of the most recent 3-year period (1995-97). The RHA specific rates are calculated with Alberta Health and Wellness population estimates using 1998 boundaries from the Alberta Health and Wellness Registration files. The Alberta Health and Wellness population estimated for 1996 has less than 2 percent overall discrepancies from the Statistics Canada Census. The discrepancy is also less than 2 percent in each of the age groups with the exceptions of the 0-4 year and over 85-year age groups.

Coding

Methods for coding cancers have evolved over the years and continue to be refined. Cancers are currently coded according to the International Classification of Diseases for Oncology, second edition. (ICD0-2) which classifies all tumours by site and morphology. The primary site of incident cancers is the tissue or organ in which the cancer originates. In general, data are tabulated by a three-digit topography code with some exceptions. For certain morphologies such as lymphomas, classification by morphology takes precedence over topography.

It is possible for one individual to be diagnosed with more than one incident primary tumour, either at the same time or subsequently. The Alberta Cancer Registry follows the SEER rules for coding multiple primaries, which in general records separate primaries if the histology (sub) site or laterality is different from a previous cancer, or a new cancer is diagnosed more than 2 months after the initial diagnosis that is not stated to be recurrent or metatastic. SEER (Surveillance, Epidemiology and End Results Program) is a program of the United States National Cancer Institute that collects and publishes cancer incidence and survival data from population-based cancer registries. NAACCR (North American Association of Central Cancer Registries), in which the Alberta Cancer Registry is an active member, supports the use of SEER coding rules for multiple primaries.

Microscopic examination of tissues or cells is the definitive diagnostic

test for cancer. During the period 1979-1997 93% of all cancers registered in the Alberta Cancer Registry were microscopically verified. In particular 98% of breast cases, 95% of prostate cases, 88% of lung cases and 96% of colorectal cancer cases were microscopically confirmed.

The completeness of case ascertainment may be estimated by an index derived from the ratio of the age-standardized incidence to mortality rates. For 1991-1995 relative to the combined SEER registries, the relative completeness of the Alberta Cancer Registry was estimated to be approximately 95%.

The underlying cause of death is coded according to the 9th edition of the International Classification of Disease (ICD-9). Data are tabulated by three-digit codes.

The Alberta Cancer Registry reviews the underlying and contributing cause(s) of death for all Albertans with a mention of cancer on the death certificate. If the cause of death is inconsistent with the person's last known condition further information is requested. Based on this information the underlying cause of death is reviewed and may be coded on the Registry as different from that appearing on the death certificate. In 1997, approximately 85% of deaths had the same ICD9 3 digit code, 5.4% were deemed to be in the same site (e.g. head and neck), and 3.1% were coded as primary unknown on one source and specific site on the other. In only 6% of deaths was there significant disagreement.

Statistical Methods

Age-Specific Rates

Age-specific rates are calculated by dividing the number of incident cases or deaths occurring in a given calendar period, in a given age group for a particular sex by the corresponding age, sex specific Alberta population for the calendar period. Age-specific rates are expressed per 100,000 person years.

Age-Standardized Rates

Age-standardized incidence and mortality rates are presented because rates vary with age and if the crude rates (total number of cancer cases/total population/period of observation) are used for comparison

purposes, they will be affected by differing population age structures. Age-standardized rates estimate the average cancer incidence rate that would have occurred in a standard population if the actual age-specific rates within that region had prevailed in the standard population. To compare cancer incidence rates over time, or with other geographic areas, all rates to be compared should be standardized to the same standard population. The 1991 Canadian Census population is used as the standard population in the calculation of the age-standardized cancer incidence and mortality rates in this document.

Time Trends

In all plots of trend over time three-year moving averages are used to smooth out the effects of random year-to-year variation. These are calculated by averaging the numbers or rates over three year periods centred on a given year. Moving averages are presented for 1980-1996 for incidence, and for 1988-1996 for mortality. Data from 1979-1997 are included for incidence and from 1987-1997 for mortality, because of the use of three year moving averages. The shorter period is used for mortality because the quality of the pre 1987 mortality data is not adequate for analysis.

Average numbers of cases and deaths are plotted to describe the trends in the total burden of cancer and also reflect the changes in population structure. The age-standardized and age-specific incidence rates reflect the relative changes in the underlying rates.

Confidence Intervals (CIs)

A confidence interval (CI) is indicative of the precision of the estimate and in these data is mainly a reflection of the population size on which the estimate is based, and not on the quality of the data collected.

Nonmelanoma Skin Cancer (NMSC)

Approximately 30 percent of malignant cancer cases diagnosed each year amongst Albertans are NMSC. There are specific rules for collecting NMSC that under-represent the true number of cases diagnosed each year, therefore they are not included in the incidence rates for All Cancers. Although these tumours are malignant, their clinical course is almost invariably positive – with almost a 100% survival rate.

Cancer in Alberta

A Regional Picture

Regional Data In Pocket

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